

1990 markets are strong but few expect any growth

by Gordon Duffy

Much of the "oomph" may be gone from the U.S. economy and from growth in the 1990 hvac markets, but what's left isn't too shabby.

Even though some categories will be down a bit this year, a market that supports more than 4 million unitary air conditioner shipments, more than 2 million gas furnaces, and commercial markets, shored up by exports and replacements, is not all bad. Industrial markets also continue to show strength.

Lowered long-term interest rates likely will have little effect on a housing market slowed by changing sources for construction loans and lower consumer confidence. Even so, an increase in single-family starts should compensate for more multi-family losses to produce an even year.

Replacements continue to be important for both the residential and commercial-institutional markets. With the exception of comfort cooling and heat pumps, however, this market tends to follow overall economic growth.

Interest rates, down from a year ago, continue to be higher than they should be. The need to attract foreign capital to finance the continuing federal budget deficit is the principal culprit. Near-full employment nationally and construction unemployment at its lowest rate in a decade will mean slightly higher inflation.

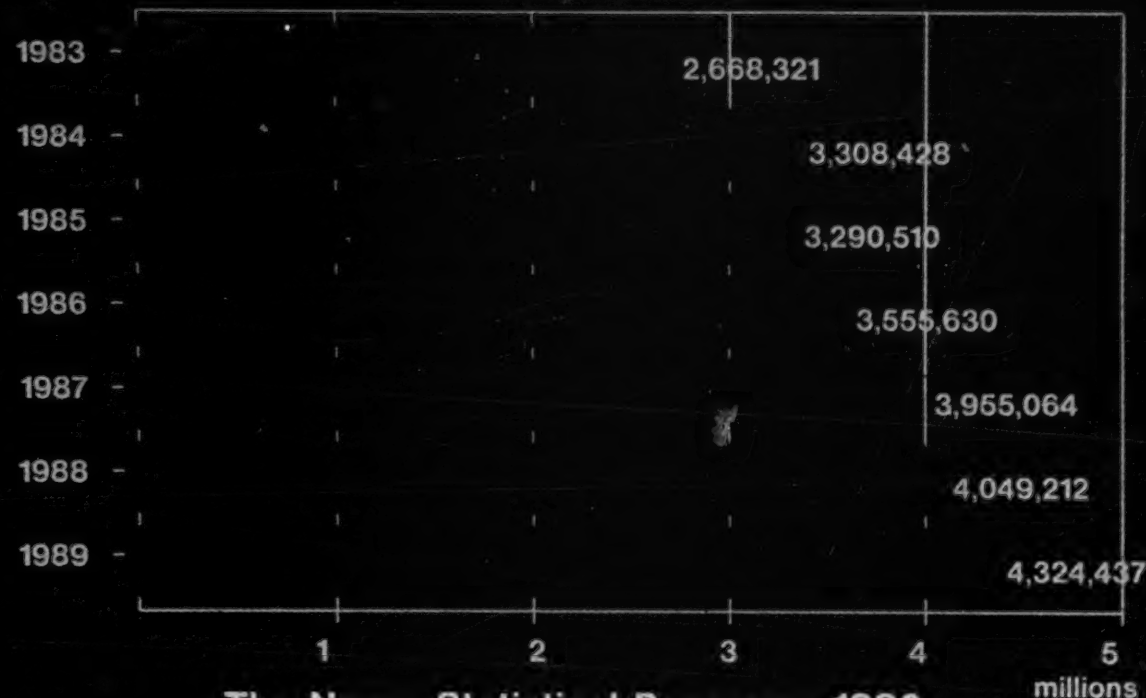
Exports, particularly unitary equipment, produced a larger positive trade balance last year. A strengthening dollar should have only a minor impact in 1990 on this \$2.6-billion market segment.

Overall, industry activity continues on a high plateau with the prospect of renewed growth in the years ahead. Look for 5 million unitary shipments by 1995.

For more details, read on.

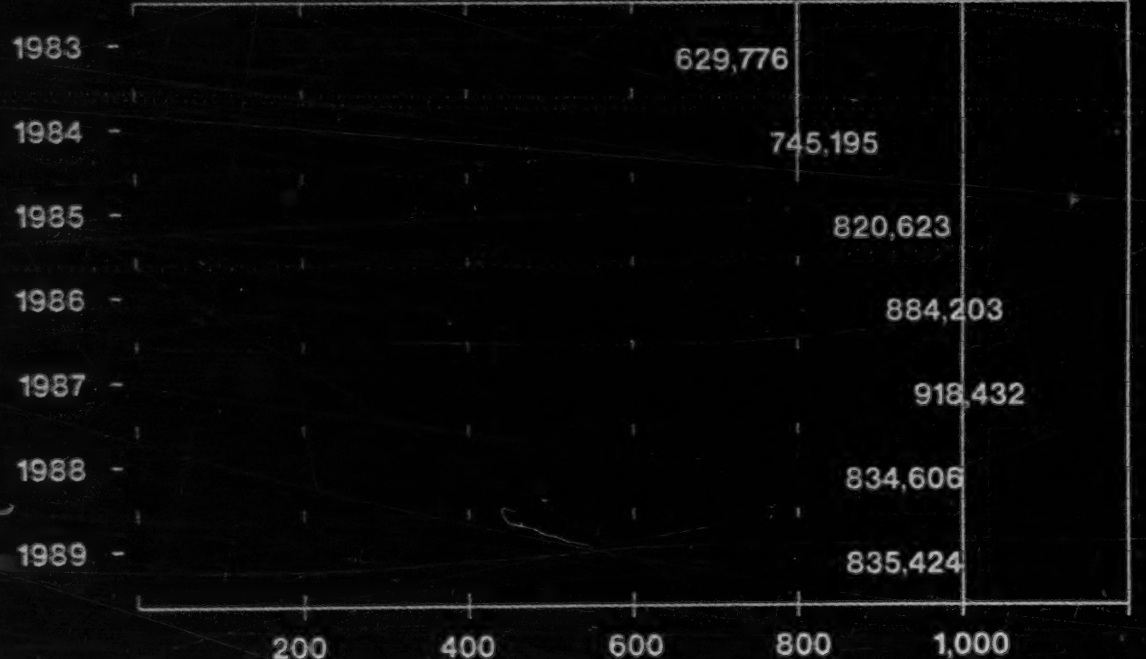
STATISTICAL PANORAMA

UNITARY AIR CONDITIONERS Unit shipments



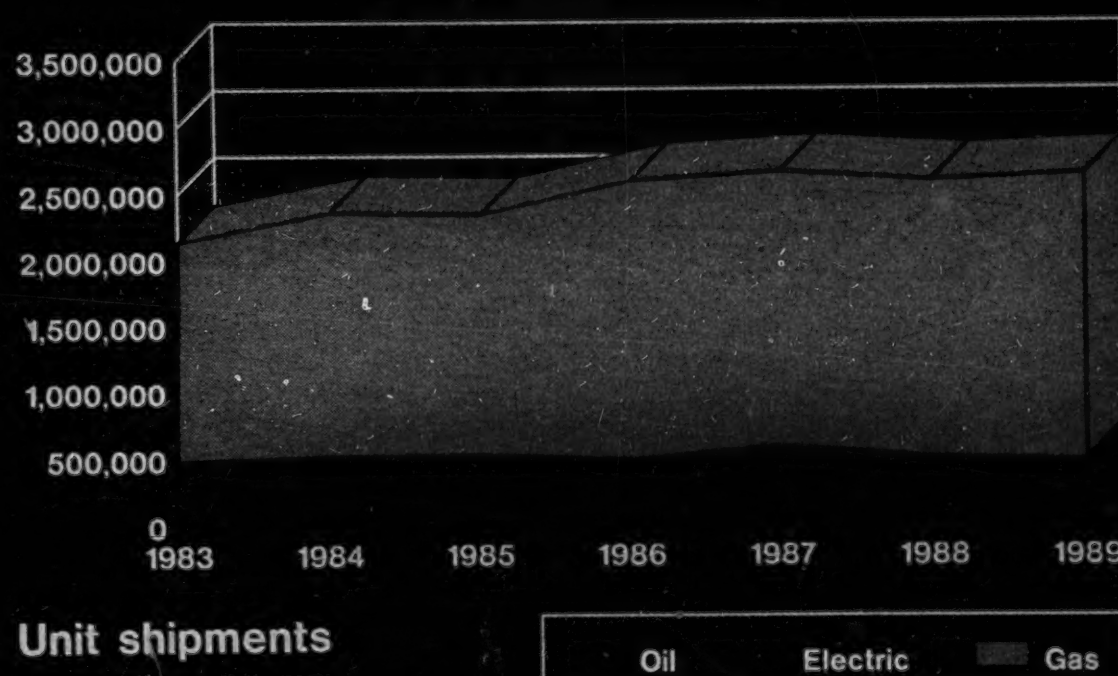
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HEAT PUMPS Unit shipments



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FURNACES (Gas, Oil, Electric)



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STATISTICAL PANORAMA

FORECASTS

Air conditioning — The impetus of 1.7 million comfort cooling replacements and multiple units in larger new homes will keep 1990 unitary shipments within 5% of last year's record at 4.1 million units.

Heat pumps — Even though demand for heat pumps in 1990 will approach 850,000 units, a serious buildup in inventory will be reflected in a 7.2% decline — to 775,000 heat pumps — as OEMs draw down an overstuffed pipeline.

Furnaces — A small gain for gas furnaces, a small decline for oil furnaces, and a flat electric furnace market will combine to produce another level year — within a whisker of the 2.7-million record set in 1986.

Boilers — Despite a further decline in new home starts in the prime Northeast market, replacements and efficiency upgrades should keep the 1990 residential boiler market even at 337,000 units.

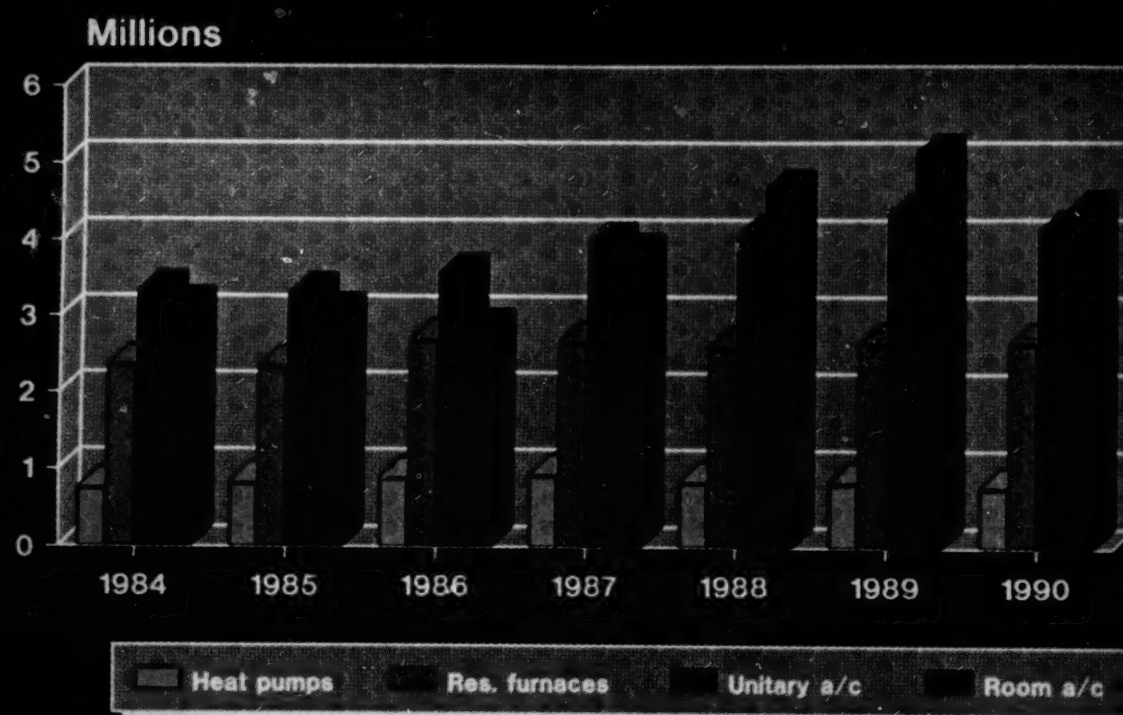
Chillers — Exports, which accounted for more than 30% of chiller shipments last year, can be counted on to help produce a 5% improvement in 1990, to 15,800 units. Last year was the best for centrifugals since 1975.

Room air conditioners — After inventories were slashed by the hot summers of 1987 and 1988, room unit stocks were restored in last year's 5-million unit surge. Look for a 14% drop to 4.3 million units this year, but a hot summer could dramatically change the fortunes of this impulse-sensitive product.

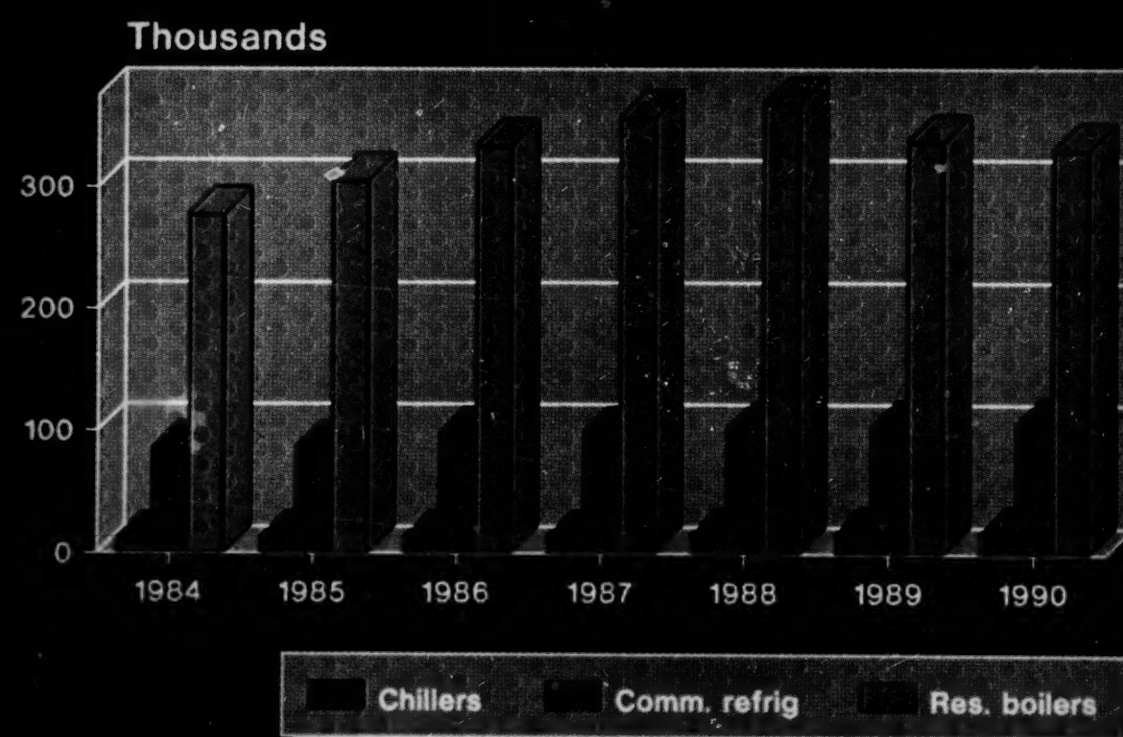
Commercial refrigeration — One of the most stable hvac markets, commercial refrigeration shipments can be counted on to produce a 2% improvement this year, to 104,500 units. Imports, however, are beginning to make a dent.

Housing — Single-family home starts, led by a strong trade-up segment, will top 1 million units again this year. But a sagging multifamily market will keep total starts even at 1,380,000 units.

Replacements — With furnace and boiler replacements already accounting for 65% to 80% of shipments, most of the growth is coming from comfort cooling and heat pump replacements. More than half of cooling units and one-third of heat pumps shipped are replacements.



The News: Statistical Panorama 1990



The News: Statistical Panorama 1990

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for products shipped, The News relied on its sources to help provide estimates.

More imports and stable growth ahead if oil prices stay low

Looking ahead, it would appear that what happens to world oil prices will determine the cost and availability of other energy sources. The assumption of relatively low future oil prices implies generally low energy prices through the rest of the century.

According to the Gas Research Institute (GRI) baseline projection of U.S. energy supply and demand to the year 2010, the nation must also react to the increasing probability of a shortfall in electric generating capacity in the 1990s and the growing importance of environmental concerns as a driver in developing national energy policy.

In its projection, GRI expects petroleum consumption to grow at a slower rate than overall energy. Transportation will account for about half of that growth (from 34.4 quads in 1988 to 37.4 quads in 1995 and 42.7 quads in 2010) and industrial and electricity generation will also be major contributors.

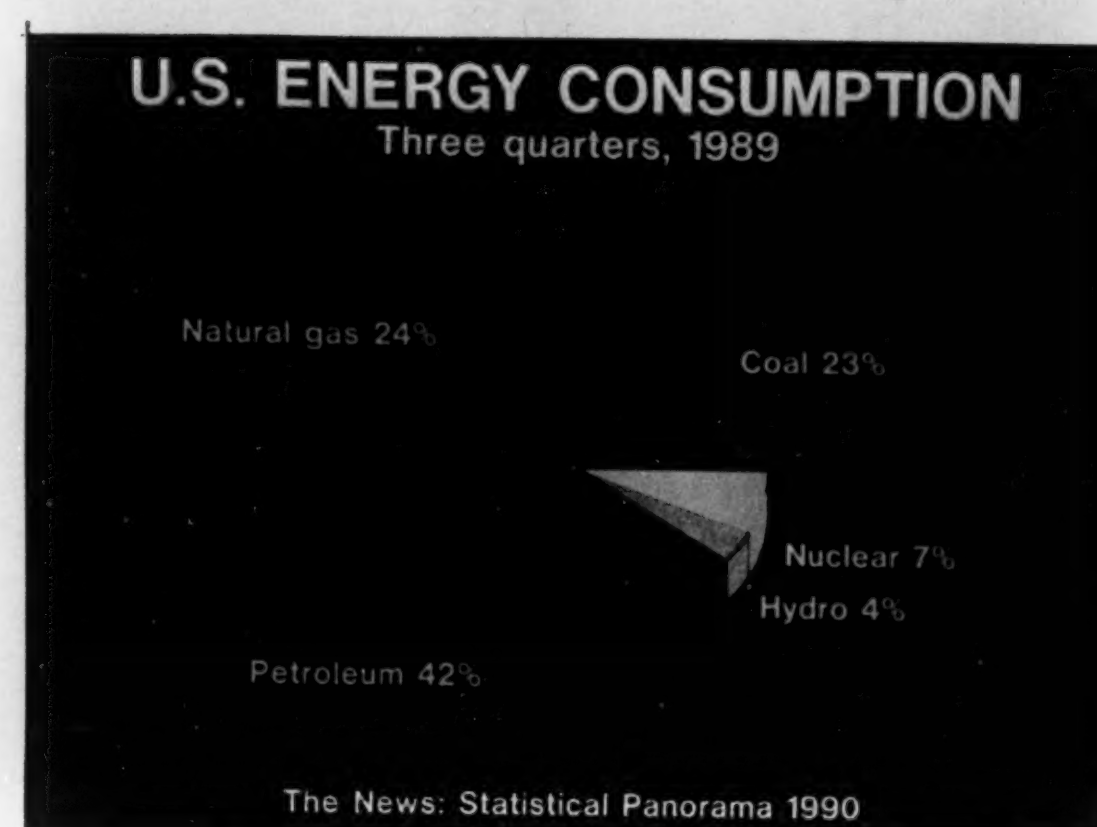
The forecast is based on refiner acquisition costs rising to \$32/barrel by 2010. If oil prices are higher, other energy prices will be higher, economic activity lower, and conservation greater.

Domestic petroleum production is projected to decline from 10 million barrels/day in 1988 to 7.2 million barrels/day in 2010. Oil imports will reach 13.4 million barrels/day — or double the 1988 rate of 6.3 million barrels/day — by 2010 and account for two-thirds of total U.S. consumption.

Increased use of coal, from 18.9 quads in 1988 to 20.1 quads in 1995 and 26.9 quads in 2010, could be tempered by restrictions stemming from global warming fears. Changes in environmental policy relating to acid rain, although costly on a site-specific basis, would only slightly alter the competitive economics of coal. Any restrictions would reflect directly on demand for oil and gas.

The projection assumes only the completion of the nuclear power plants now under construction. The nuclear contribution — 5.7 quads in 1988 and growing to 6.7 quads in 2000 — will slip to 6.3 quads by 2010 after the scheduled retirement of some plants. Natural gas consumption is expected to grow at only 0.7% a year — from 18 quads in 1988 to 18.4 quads in 1995 and 20.6 quads in 2010. It involves shifts between diminishing industrial and residential uses and increasing requirements of electric utility and commercial space cooling.

By the year 2010, energy conservation improvements are expected to reduce primary energy demand by almost 31 quads below what would have been required at 1988 levels. There is some uncertainty that all of the expected improvement will be realized with stable and relatively low energy prices despite building codes and appliance efficiency standards.



Rapid efficiency improvement in space heating is expected to offset residential growth in water heating, cooking, and space cooling. The introduction of commercial gas space cooling technologies now nearing commercialization is expected to account for a third of commercial gas growth.

Natural gas production in the lower 48 states is projected to remain relatively stable. Pipeline

imports from Canada will grow rapidly in the 1990s and then stabilize. Mexican gas imports could resume after the year 2000, a time when advanced recovery technologies and pipeline deliveries from Alaska become critical to maintaining supply.

LNG (liquefied natural gas) imports from Algeria, the Caribbean, Nigeria, and Norway will grow rapidly in the 1990s. The growth of LNG imports after 2000 implies a significant expansion of existing terminals and/or a completely new delivery system.

In 1988, the average natural gas acquisition cost per million Btu was \$1.71 (\$1.67 for domestic gas and \$2.19 for imports). This price is expected to rise to an average of \$2.57 by 1995 in constant 1988 dollars (\$3.66 in 1995 dollars) and reflects a domestic acquisition cost of \$2.50 and an import cost of \$2.97. By the year 2010, the average cost is expected to rise to \$4.97 (\$4.93 for domestic gas, \$5.09 for imports).

The Energy Information Administration (EIA) reported that, in 1989, domestic crude oil production averaged 7.7 million barrels/day and that, by 2010, it will drop to between 4.1 and 5.6 million barrels/day. In Alaska, which accounts for nearly 25% of domestic production, the North Slope and Prudhoe Bay fields have passed their peak and other major fields are expected to follow in the early 1990s.

The oil spill in Alaska's Prince William Sound has intensified environmental concerns. In October, 1989, President Bush signed a bill banning oil or gas drilling on 84 million acres off the coasts of Alaska, California, the East Coast, and the eastern Gulf of Mexico.

For more information on fuel and energy consumption in the U.S. during 1989, turn to page 56.

Financial management plays important role in business

by Bryan E. Milling

Poor financial management can transform a promising enterprise into a business failure.

Unfortunately, financial concerns remain a low priority for many business managers. That priority rises only when a financial problem appears, and remains only as long as the problem. Then the managers turn their attention back to more predominant business interests.

Too many administrators view financial management as being accessible only to academicians and management magicians. Any effort to influence financial matters presumably is futile. This attitude erases any motivation to exert positive management actions to influence a firm's financial affairs.

Attentive management, however, can reduce the potential for financial problems. A positive management response can help reduce the detrimental effects from problems that do occur.

From a different perspective, attention to financial management can help increase a firm's earnings. In any case, positive financial management makes an important contribution to a firm's success.

Let's review some positive financial management strategies. The examples discussed here, while not comprehensive, help show the benefits.

A cash flow budget helps to forecast a firm's cash receipts. It also anticipates a firm's required cash expenditures. The budget, then, interrelates the expected receipts and expenditures to identify potential gaps in cash flow.

Identifying those gaps — times when cash outlays would exceed cash available — sets the premise

for cash flow budgeting. In the absence of a budget, cash shortages become unhappy financial emergencies. Surprised managers must scurry to meet the firm's obligations. Or they must find excuses not to meet scheduled responsibilities.

With the foresight that comes from a budget, a manager gains time to fill a cash flow gap before it develops. In some instances, a bank loan might be used. Or, management might take steps to accelerate customer payments. A business manager might also arrange to defer a scheduled payment to a supplier or other creditors.

The budget lets managers anticipate potential problems. Instead of reacting to difficulties after they arise, managers can prevent them.

Credit and collection

Businesses should not extend credit haphazardly. Nor should loose collection policies allow customers to defer payments beyond the firm's stated credit terms.

Yet, many business managers are reluctant to implement active credit and collection policies. They assume that more stringent credit terms will hinder sales growth. And they assume that a conscientious collection effort will upset slow-paying customers.

These assumptions ignore sensible management logic. More stringent credit and collection policies will reduce sales to less credit-worthy customers. Sales to these customers increases a firm's expenses.

One increase comes from the cost of carrying the increased receivables resulting from slow payment. Another comes from the higher bad-debt write-offs. A

large proportion of sales to those customers becomes uncollectible.

In any event, a manager should create a credit policy that makes sense for the business. The absence of an established policy leaves credit decisions to chance.

By the same token, managers should not let customers pay haphazardly. A positive financial management effort "educates" customers about payment expectations. That means a business must show customers that they expect payments in accordance with stated invoice terms.

Make it a practice to contact customers — particularly new ones — when they fall only a few days past due. The contact (in the form of a letter or phone call) signals that the firm expects payment in accordance with invoice terms.

The contact also implies that failure to pay within the stated terms may become an obstacle to future credit consideration.

Controlling the size of a firm's inventory investment combats the natural management urge to carry excess stock.

That urge stems from the fear of losing sales when a customer wants an item that is out of stock. To compensate, managers carry more inventory than the business needs for expected sales.

Excess inventory absorbs cash that can be used elsewhere. And the business with excess stock sustains an increase in expenses from inventory that deteriorates or becomes obsolete as it sits on the shelf.

Positive financial management can reduce those losses. Inventory turnover analysis measures the average sales rate for significant stock. The analysis helps identify the inventory level adequate to meet expected demand.

A balance sheet reveals important information about the immediate and long-term health of an hvacr contracting business. Starting on page 45, Fails Management Institute presents and interprets a sample balance sheet. St. Louis contractor Butch Welsch also adds his real-world perspective to the exercise.

To illustrate, assume analysis indicates that a business averages 30 green widget sales per month. Peak sales in recent months total 46. But the firm keeps 120 green widgets in stock.

Further analysis indicates that the green widget supplier fills all orders in 30 days. The firm has enough green widgets to meet four months' sales requirements. Only half that inventory is necessary for normal requirements.

The firm can reduce its stock of green widgets without risking a sales loss. That reduction also will improve cash flow and increase earnings.

A look at the accounts payable centers on potential benefits available when a business takes advantage of discounts some suppliers allow for early payments.

Assume a business makes some purchases on "2% 10, net 30 days" credit terms. That means the supplier expects payment of the full invoice in 30 days. But it also will allow a 2% discount off the invoice price if the business pays for the purchases in 10 days.

Many business managers ignore such discounts. They consider the 2% as "not worth the effort." So, they pay the full invoice in 30 days. But ignoring the discount is an expensive mistake.

Let's assume that a business

makes \$10,000 in purchases monthly from suppliers who allow a 2% discount off the invoice price in exchange for payments made in 10 days. The business could save \$200 by making a \$9,800 payment 10 days after the purchase.

Standing alone, that \$200 may not seem significant. But assume the business makes \$10,000 in purchases from the same suppliers each month for a year. Cumulatively, ignoring the 2% discount costs the firm \$2,400. Taking the discounts would add \$2,400 to the firm's bottom line.

Skipping a 2% discount for a 10-day payment — then paying in full in 30 days — becomes a 37.72% annual percentage charge for using the supplier's money for the extra 20 days. The same managers who blithely skip those discounts complain when a bank charges a 12% annual interest rate on a loan.

In fact, a business can add to its profits by borrowing from a bank to gain the cash necessary to take such discounts. The benefits from the discounts easily exceed the cost of borrowed funds.

Exercising positive financial management reduces the potential for financial problems and increases profits. Both benefits make it worthwhile to become a positive financial manager.

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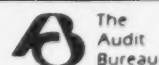
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LABOR

Construction industry wage-and-fringe union labor rates increased by 3% in 1989, the same as in 1988 and the sixth year in a row of labor increases of 3% or less, according to the Construction Labor Research Council (CLRC).

The average first-year increase of 65 cents/hour among contracts negotiated in 1989 was higher than the 47 cents/hour, or 2.2%, recorded in the previous year but there were few other changes. There were, however, fewer contracts with wage freezes or roll-backs.

Of the 65-cent total increase, CLRC said only 35 cents represent higher wages. A disproportionate share of the total, 17 cents/hour, was added to health and welfare funds and reflected the continued escalation of these costs. The remainder was split between 8 cents for pension funding and 5 cents for other benefits.

The average second-year increase was 76 cents/hour, or 3.2%, and considerably higher than the 58 cents/hour, or 2.6%, in the second year of agreements negotiated in 1988. Almost 60% of all agreements were multiyear.

CLRC reported that, in 1989, all regions experienced dollar increases at the same level as in 1988 or higher. Increases were higher in all regions except the Middle Atlantic and East North Central regions. The smallest dollar increases were recorded in the Southeast and West North Central states, while the smallest percentage increases occurred in the West North Central and Southwest Pacific regions.

Only in the Southwest and South Central regions were one-year agreements most common. These regions also accounted for more than half of all contracts with wage freezes.

Many of the trends that have existed in the construction environment continued during 1989. Employment grew slowly throughout the year and now approaches 5.4 million. The construction unemployment rate, at 10%, is at its lowest level since 1973.

UA and SMWIA

Of the 42 contracts negotiated by United Association (UA) pipefitter and pipefitter-plumber locals in 1989, the average first-year settlement was 86 cents/hour, or 3.5%. And, of these, 23 agreements included second-year increases of 89 cents/hour, or 3.4%.

Of the 25 agreements negotiated by locals of the Sheet Metal Workers' International Association (SMWIA), the average settlement was 63 cents/hour, or 2.9%. The union did not negotiate any multiyear agreements.

The council said the construction union average hourly rate

now is more than \$23/hour, or a 16.7% increase above the rates five years ago. The Northeast and the Southwest Pacific regions have rates more than \$2 above the national average; the North Central and Northwest are just below the national average; and the three remaining regions are below \$17/hour.

Over the period Jan. 1, 1985, through Jan. 1, 1990, UA pipefitters increased their average wage from \$21.86/hour to \$25.47/hour, a difference of \$3.61/hour or 16.6%. UA plumbers rose from \$23.44/hour to \$28.68/hour during the same period, a difference of \$5.24/hour or 21.6%.

Similarly, the average rate for SMWIA members rose from \$21.83/hour in 1985 to \$25.24/hour in 1990, an increase of \$3.41/hour or 16.2%.

More than half of all agreements will be renegotiated during this year. It is slightly less than in recent years and reflects the trend toward multiyear contracts. This will mean a lighter bargaining load in 1991, but a much more active 1991.

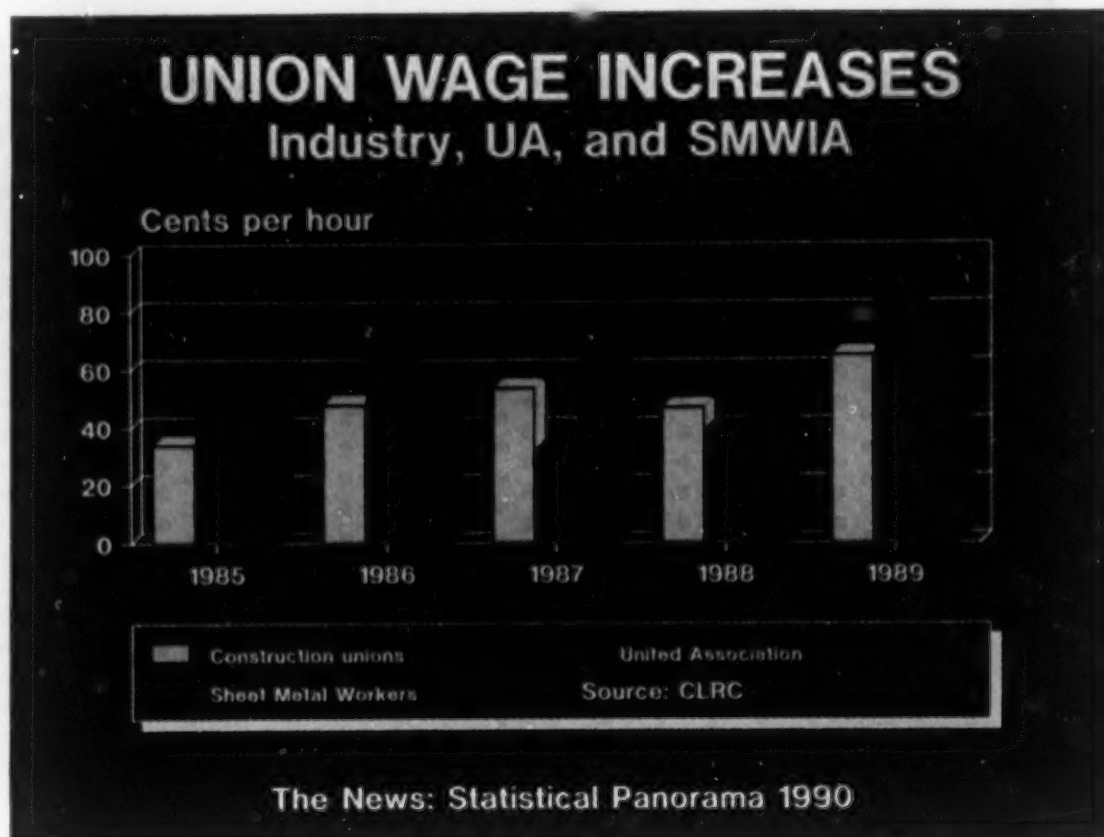
Looking back, the declining market share of union construction and greater emphasis on construction cost effectiveness meant major changes for construction unions. A most significant indicator is wages.

In the period 1970 through 1980, for example, average union construction wages rose by 42.5%. In the period 1980 through 1985, the increase was 40.6%. But in the period 1985 through 1990, the increase was only 16.7%.

Other rates

So far we have dealt with union wage rates where the information is more readily available. Data for open shops, which account for about 80% of the nation's hvac contractors, is more difficult to come by.

A survey of News readers in 1989 revealed that the average payroll labor cost, including



fringes, ranged from \$14 to \$18 an hour. The average charge-out rate ranged from \$35 to \$39 an hour. Both sets of figures are identical with a previous survey conducted in 1988.

Broken down by union and open shop segments, we found that payroll labor costs for union contractors ranged from \$19 to \$26 (the same as in 1988) and, for open shops, from \$10 to \$13, down from \$14 to \$18 in 1988.

The median charge-out rate for union contractors ranged from \$40 to \$44 an hour and, for open shops, from \$30 to \$34 an hour. Median sales per union service technician, at \$96,333, was also higher for union shops. The median for open shops was \$74,800.

A look ahead

According to a study by the U.S. Bureau of Labor Statistics, construction is projected to add 760,000 jobs between 1988 and 2000 to reach 5,885,000. Construction activity is expected to expand at a 2.1% annual pace, slower than the average rate between 1976 and 1988.

The study projects that the

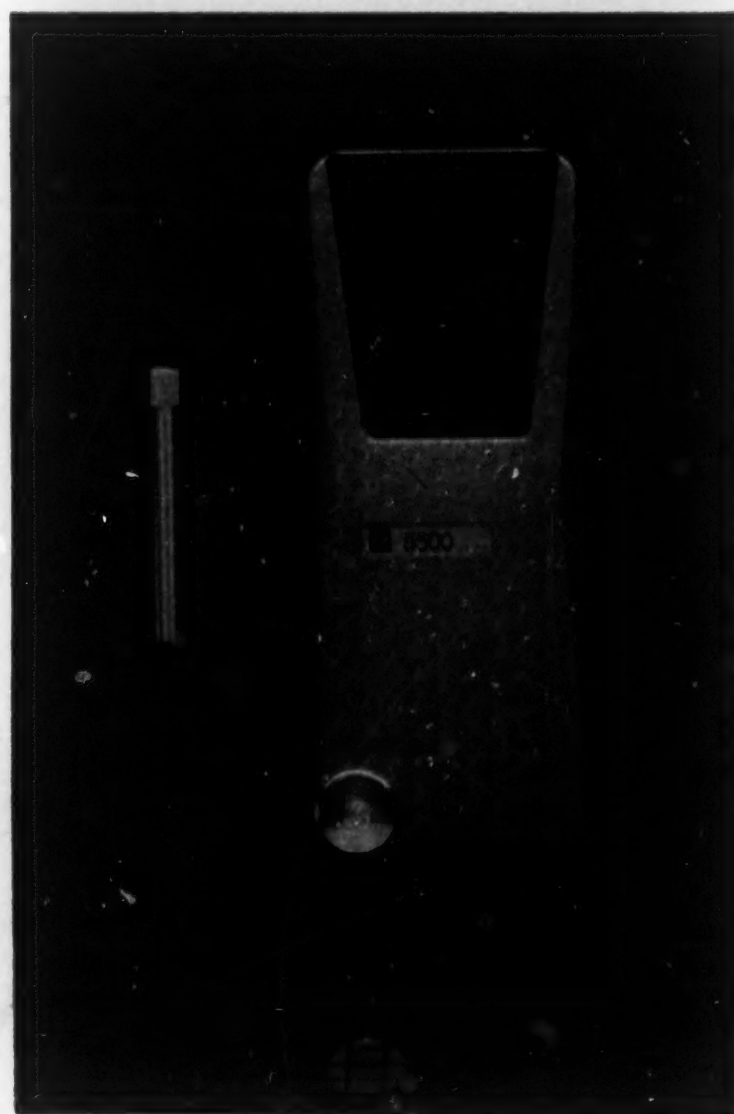
slump in industrial construction will turn around in the 1990s as manufacturers invest in more modern technologies. The oversupply of office and commercial space will be absorbed in the early 1990s and construction will rebound. A slowdown in the formation of new households, however, will limit new home construction.

Although fewer households will be formed during the 1990s because of the drop in birth rates during the 1960s, growth in the population aged 35 to 64 will accelerate and result in a continuing shift to a home tradeup market. New homes will increase in size, leading to an increase in the average real value of a housing unit.

Real spending on residential investment, which grew at an average annual rate of 2.6% between 1976 and 1988, is expected to moderate only slightly to 2.1% between 1988 and 2000.

The refrigeration and service machinery industry, with employment at 160,000 in 1976 and 185,000 in 1988, is expected to remain even in terms of employment but output is expected to increase by a 1.7% annual rate.

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AIR CONDITIONING

Total shipments of U.S. unitary air conditioners (including air-to-air heat pumps) in 1989 increased by a heady 6.8% to a new record total of 4,324,437 units, according to the Air-Conditioning and Refrigeration Institute (ARI). The 1988 total — the previous record — was 4,049,212 units.

The losses in new home starts and a slight dip in commercial unitary shipments were more than compensated for by a continuing surge in unitary replacements and a strong add-on market. Total unitary replacements last year accounted for almost half of the shipment total, according to *News* estimates.

Last year was the second 4-million-plus shipment year and they followed four years in which more than 3 million unitary air conditioners and heat pumps were shipped. It was evident, too, that the momentum garnered from the hot summers of 1987 and 1988 carried through well into the much more normal summer of 1989.

Looking ahead, we cannot count on another hot summer, even though it may well happen. Single-family housing starts will be flat and multifamily unit construction will continue to drop. And, more importantly, heat pump inventories have swelled uncomfortably.

Continuing strength in the replacement and add-on markets, plus a recession-free economy and moderate interest rates, should push unitary air conditioner shipments in 1990 over the 4 million mark once again. *The News* predicts that unitary shipments this year will total 4.1 million units, down about 5% from 1989's record.

The replacement of worn out or inefficient units continues to grow. Remember that, in the years 1976 through 1980, an average of nearly 2 million cooling-only units were shipped. The job of replacing them in 1989 accounted for more than 1.5 million residential air conditioners and another 235,000

commercial units.

These figures do not include air conditioning units and air-to-air heat pumps shipped to foreign markets. Exports of U.S. unitary air conditioners in 1989 totaled 310,200 units, up 37.3% from the previous year's total of 226,000 units. The 1988 total represented a 72% increase and for the first time brought unitary exports well above the 100,000-unit level experienced for many years.

It should be remembered also that these figures include only those units shipped directly to foreign destinations by original equipment manufacturers (oems) and include few, if any, units shipped by distributors and contractors.

Of the 4,324,437 unitary air conditioners shipped in 1989, ARI estimates that 85% — or 3,675,772 units — were for residential applications and 15% — or 648,715 units — were for commercial applications.

That ratio has changed from the

82%-17% split used since 1985 and the 78%-22% split that held sway through the 1970s and early 1980s. In fact, ARI believes that the push of residential replacements may push the commercial share to 12% in the near future by sheer weight of numbers.

Today's residential-commercial ratio is much different from that posted in 1952, the first year in which these data were available, when 66.9% of unitary equipment went into commercial applications and only 33.1% went into homes.

The unitary category includes electric air conditioners, gas air conditioners, air-to-air heat pumps, and rooftop equipment. It does not include packaged terminal air conditioners (ptacs) and packaged terminal heat pumps (pthps), room air conditioners and heat pumps, heat pump water heaters (air-to-water heat pumps), or water-source heat pumps.

The inventory of unitary air conditioners at the end of 1989 totaled 1,297,000 units, an increase of

27.6% from the 1,016,200 units in inventory at the end of 1988. As a percentage of total shipments, the increase from 25.1% in 1988 to 30% in 1989 was not alarming in itself. After all, a ratio of 30% to 33% had been normal for much of the industry's history.

Of the total inventory at the end of 1989, some 505,000 units — or 39% — were at the factory, and 792,000 units — or 61% — were at the distributor level. This represents a 2.5% shift toward field inventories last year and is in sharp contrast to the 49%-51% split in favor of distributors at the end of 1983.

The shift toward distributors in 1989 followed a similar 2% shift in the previous year. But the unitary totals mask the real culprit — heat pump inventory. The inventory of cooling-only units, at 303,700 units or 41% at the factory and 429,200 units or 59% in the field, was virtually identical in both years.

Inventory warp will hurt heat pump totals in 1990

Despite a flat replacement market and an additional decline in new home starts, including a near 7% drop in the prime market in the South, heat pump shipments held their own in 1989. But there is a large cloud behind that silver lining.

Shipments of air-to-air heat pumps in 1989 totaled 835,424 units, an increase of 0.1% over the 834,606 heat pumps shipped in the previous year. The 1988 total represented a 9.1% drop from the record-year total of 918,432 units shipped in 1987.

The cloud comes in the form of inventory buildup — the pipeline. The hot summer of 1988 drew down heat pumps in inventory and, last year, it would appear that manufacturers significantly overcompensated.

At the end of 1988, the heat pump inventory totaled 283,000 units, or a reasonable 33.9% of shipments. But a year later that total had swelled to 564,100 units,

a twofold increase to an unreasonable 67.5% of shipments. Obviously that bulge has to be reduced and much of that reduction will come in the form of lowered 1990 shipments.

If the manufacturers of heat pumps did not also produce cooling-only units, the overstuffed pipeline would lead to a serious drop in this year's heat pump shipments. But most of the oems produce both products and they go to market through the same channels. Combined heat pump and cooling-only unit inventories still are quite manageable.

For this reason, then, we believe that heat pump inventories will be drawn down by only about 75,000 units. That, against a demand *The News* estimates at 850,100 units, means that heat pump shipments in 1990 will be in the order of 775,000 units, or 7.2% below last year's level.

Heat pump penetration in the new single-family home market

has dropped from a high of 30% to 26% in the last few years because of reduced activity in its prime market, the South, and losses in the Northeast and Midwest. Replacement and modernization (add-on) sales also have declined marginally in the last two years for much the same reasons.

In spite of these developments, the prospects for air-to-air heat pumps continue to be bright. Housing starts in the South are expected to turn around in 1990 and should increase slowly in the years beyond. This will result in both increased heat pump shipments and market penetration. And, buoyed by average shipments in the 1976 through 1980 period of 450,000 units, replacements — now at about 275,000 units annually — should increase dramatically.

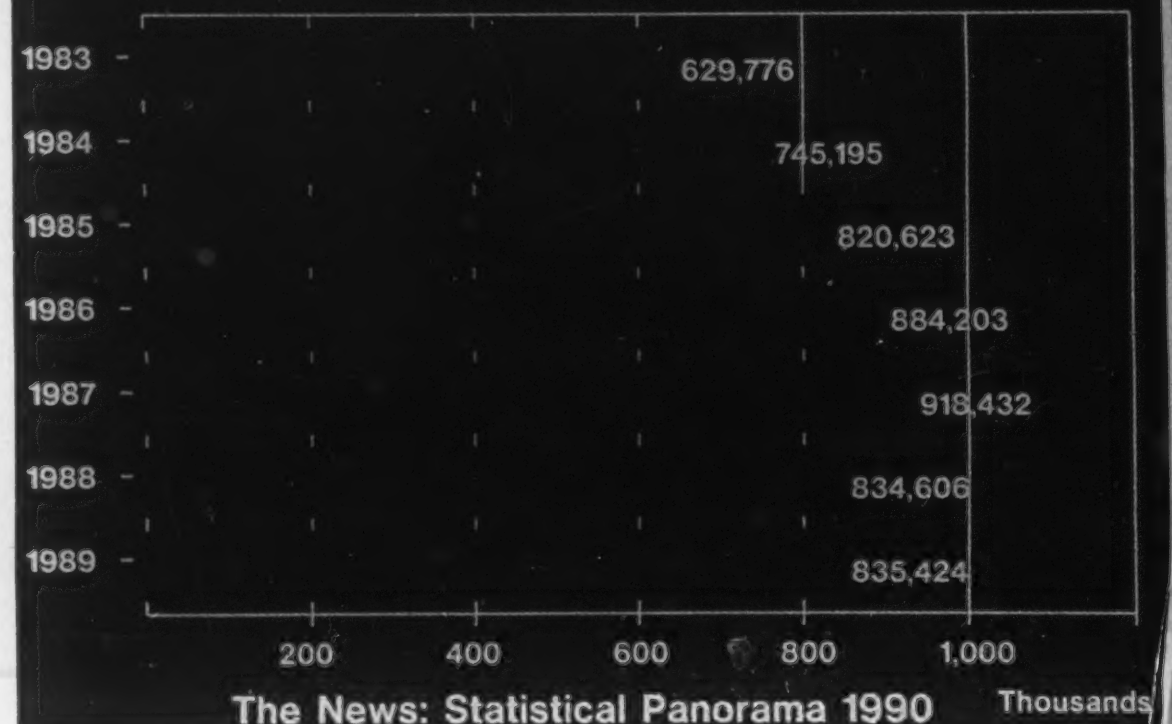
Technological improvements also are playing a role. In 1988, for the first time, the average efficiency for all residential heat pumps shipped edged above that of central air conditioners. A year later, that edge was still holding, if only by a tenth of a point.

Variable-speed drives, micro-processors that make demand-defrost more practical, and scroll compressors promise to make heat pumps more attractive outside the South. The variable speeds and better refrigerant volume control, for example, make extra heating capacity possible without summer efficiency penalties.

A growing number of merchandising contractors in areas where utilities offer rebates for high efficiency already are selling heat pump replacements for worn out central air conditioners, even though the homeowner has a gas- or oil-fired furnace. The incremental cost, with the rebate, usually is small and the homeowner saves on operating cost in the spring and fall.

HEAT PUMPS

Unit shipments



Meanwhile, in the wings, the gas industry continues its development of gas-fired heat pumps and a consortium of U.S. and Japanese companies continue work on gas-engine drives. Rumors persist that the federal government also may offer subsidies for high-efficiency units as the industry moves toward the 1992 mandatory minimum 10 SEER (seasonal energy efficiency ratio).

Capacity mix

An indication of capacity mix for 1989 unitary air conditioners and how they compared with 1972's experience as shown in table above.

Installed value

The installed value of both unitary and field-engineered air conditioning systems put in place in 1988, the latest year for which these figures are available, was \$19.1 billion, an increase of 10.8% from the year-previous total of

	%	%
	1972	1989
Under 1.8 ton	16	8.4
1.8 ton to 26,999 Btuh	23	20.8
2.25 ton to 32,999 Btuh	17	19.7
2.75 ton to 38,999 Btuh	22	22.3
3.25 ton to 43,999 Btuh	6	7.6
3.67 ton to 53,999 Btuh	7	8.9
4.5 ton to 64,999 Btuh	6	8.4
5.4 ton to 96,999 Btuh	1	1.6
8.1 ton and larger	1	2.3

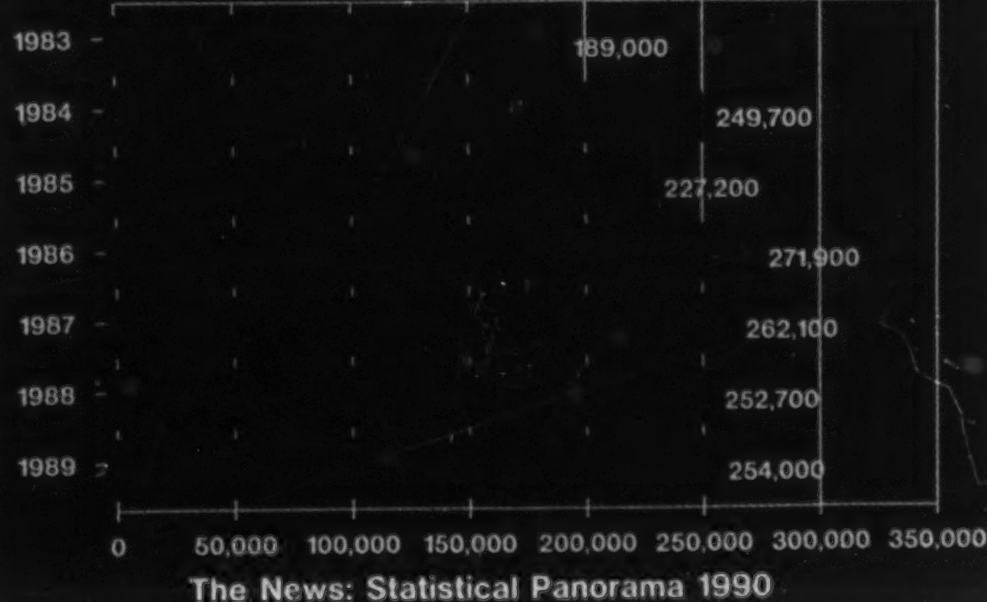
\$17.232 billion. The \$19.1 billion covers all comfort cooling systems, with the exception of room air conditioners, installed in the U.S. in 1988.

The installed value of unitary air conditioning equipment put in place in 1988 was \$12.3 billion, up 11.7% from the \$11.01 billion posted in 1987, according to ARI's Business Research Department.

Of the total, ARI estimated that

PTAC's

Unit shipments



AIR CONDITIONING

the value of commercial unitary installations in 1988 was \$3.9 billion, an increase of 8% over the previous year's total of \$3.612 billion. The total value of residential installations was \$8.4 billion, up 13.5% from the 1987 total of \$7.399 billion.

Numbers, however, sometimes can be deceiving. Commercial unitary systems in 1988 accounted for only about 15% of units but nearly 32% of the dollars, while residential equipment accounted for 85% of the units but only 68% of the dollars.

Installed value covers the cost of unitary air conditioning equipment as shipped from the factory together with labor, ductwork, registers and grilles, thermostatic and other controls, electrical wiring, and other components of the system installed by contractors.

The installed value of field-engineered systems put in place in 1988 was \$6.8 billion, an increase of 9.3% over the total of \$6.221 billion estimated for 1987. In that year (1987), the installed value of field-engineered systems dropped by 5.7%, the first decline recorded in many years.

In determining the installed value of field-engineered air conditioning systems, ARI estimates that only 7.5% of the installed cost of the system is represented by the refrigerating machine. The remaining 92.5% represents air-handling equipment, labor, ducts, pipes, valves, pumps, controls, and all other installation costs.

Packaged terminal air conditioners continued to hold their own in a relatively soft market last year. Shipments in 1989 totaled 254,000 units, an increase of 0.5% over the 252,700-unit total for the previous year. The category had experienced a 3.6% drop between 1987 and 1988.

This product is used extensively in the motel, hotel, nursing home, and suburban office park applications. All of these markets have held up reasonably well in the face of overall commercial office building declines.

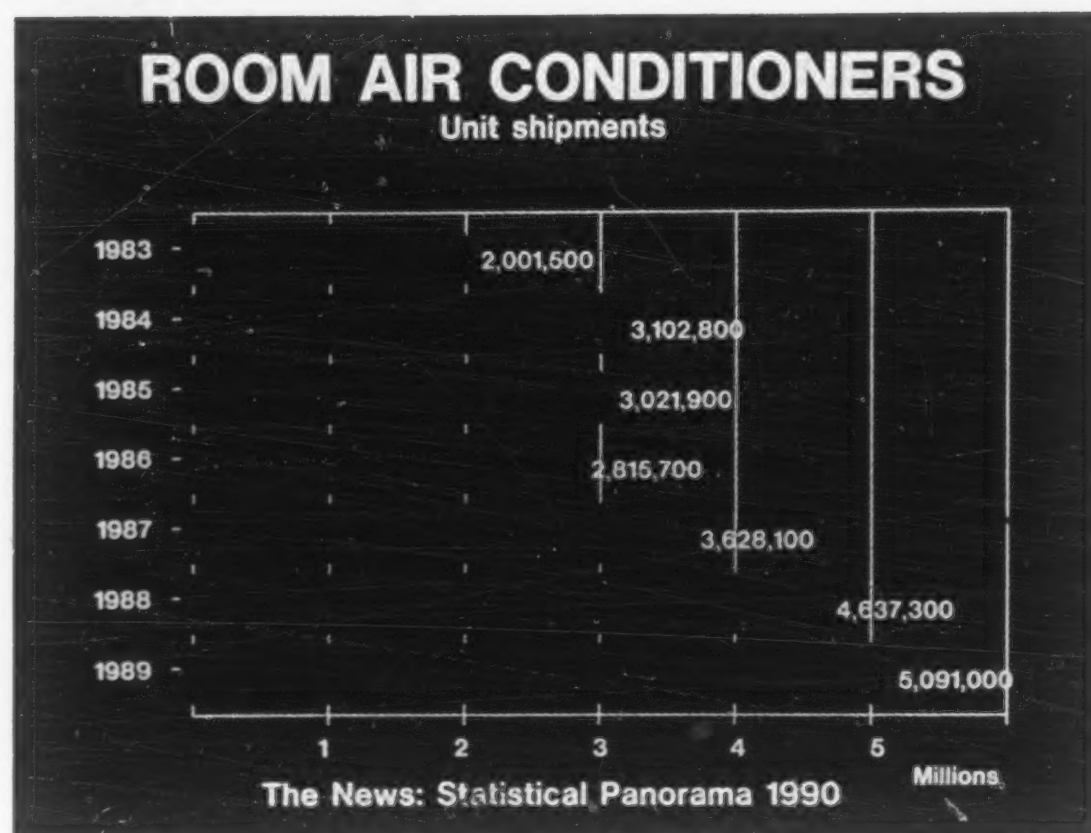
Ptacs compete head-on with commercial rooftop single-zone and variable air volume (vav) systems in the lower tonnage ranges, and with field-engineered systems in office buildings and hospitals. Heat pump versions, known as pthps (packaged terminal heat pumps), captured 45% of that market in 1989, the same as in the previous year.

The Bureau of the Census reported that a total of 120,779 ptacs were shipped in 1988, the latest year for which these data are available. That represents a sharp 48.3% decline from the previous year's total of 233,526 units. Of the units shipped in 1988, some 55,251 units, or 45.8%, were pthps. In 1987, pthps accounted for 42.1% of the total.

Water-source heat pumps

Shipments of water-source heat pumps, which showed strong growth at the beginning of the last decade only to level off in the past five years, totaled 138,700 units in 1989. That represented a 10% increase from the 1988 total of 126,100 units, down from a 138,500-unit total a year earlier.

Two types of these units serve different markets. The older segment uses closed loops tied to a



small boiler and cooling tower or evaporative condenser to maintain a loop water temperature between 60° and 90°F. They take advantage of load diversity and usually are applied in high-rise apartments or condominiums, and in small or medium-sized office buildings.

The other group initially used water from a pond, a well, or the ocean at temperatures as low as 45°, and were largely confined to rural or exurban areas. In recent years, however, the market has swung sharply toward vertical or horizontal underground water-glycol loops to provide comfort heating and cooling at high efficiencies.

Most are water-to-air units although there are a few water-to-water systems. They don't have to depend on the quantity or quality of the groundwater available at the site. Pumping costs are reduced, defrost cycles that degrade the efficiency of air-to-air units are eliminated, and they can eliminate backup heat provisions, if sized for the design heat load. They also can be applied on small lots in urban areas.

Most of these systems are applied in single-family homes. They have a comparatively high first cost and require specialized application knowledge — factors likely to limit these systems to steady, but unspectacular, growth. *The News* estimates that only about 18,000 residential and a few hundred commercial water-source heat pump systems were ground-coupled in 1989.

Heat pump water heaters

Domestic hot water in U.S. homes traditionally has been heated in gas-fired and electric resistance storage-type water heaters. A few are fired by oil or LP gas. Desuperheaters on air conditioners and heat pumps help in the South.

Medium-temperature solar systems came with federal and state subsidies and all but left with the subsidies. European instantaneous water heaters have had little impact. And, in the Northeast and parts of the Midwest, some still use water jackets on oil- and gas-fired boilers.

The air-to-water heat pump, with an installed cost more than double that of an electric resistance storage tank, entered the market more than a decade ago

with the promise of saving more than 40% in operating costs. Instead of capturing a big chunk of the 7.5-million annual water heater market, the heat pump water heater market has all but disappeared.

Integrated appliances

A relatively new product, the integrated appliance, already is carving a niche that, although still small, keeps growing. There are no figures for these systems but there is no doubt that the numbers are increasing each year.

These appliances use a conventional gas-fired water heater piped to a water coil in a separate air handler that often includes the evaporator of a split-system air conditioner. Electric water heaters do not have recovery rates fast enough for this system.

The air handler uses domestic hot water for space heating. It saves on overall fuel bills by using much of what had been domestic hot water storage losses. Special fittings on the storage tank keep plumbers and hvac technicians from becoming involved in each other's trade.

These systems are being used in both single- and multifamily homes. The market is being promoted by many gas utilities as a way back into the apartment and condominium markets after being largely shut out by the trend toward individual metering.

Hydronics manufacturers also are offering an integrated boiler and domestic hot water heater, but air conditioning, if offered, comes in the form of a separate mini-split system of Japanese design. And at least two oems offer conventional split-system air conditioners or heat pumps fitted with a desuperheater for domestic hot water production.

Each Statistical Panorama includes the latest data available. Sources frequently revise their previous year's figures, which explains apparent discrepancies between the latest and earlier published data. Where sources give significantly varying information, that data is mentioned.

Room units top 5 million

Room air conditioner shipments defied the prognosticators in 1989 and, instead of falling by more than one million units, pushed ahead by 9.8% to a total of 5,091,000 units, according to the Association of Home Appliance Manufacturers (AHAM).

The 1988 total, swelled by two hot summers in a row, was 4,637,300 units.

Why the surge last year when summer temperatures were average in most areas? There are two principal reasons, as we see it. First, room units are heavily influenced by impulse buying and, when appliance and department stores were cleaned out to the bare walls during the 1988 hot spells, consumers remembered. Many shopped early in 1989 when the new shipments arrived.

Part of the surge must also be attributed to inventory buildup in these same appliance and department stores (contractors account for only about 5% of room unit sales). It is not unusual for these stores to inventory room units for two or three seasons before they are sold. But, in 1989, many had no inventory at all.

We have also been reminded by AHAM that the shipment total includes both those units built by U.S. manufacturers and those imported from foreign countries. Although import statistics were not available when this was written, it is probable that imports accounted for more than one million units from South Korea, Singapore, Brazil, Malaysia, and Canada. U.S. exports meanwhile shrunk from 25% of domestic production a decade ago to about a quarter-million units in 1988.

In August 1989, AHAM's members forecast that room air conditioner shipments this year would be down 14.4% to 4,360,000 units. That is not an unreasonable expectation if we experience a somewhat normal summer. But if the weather turns hot for an extended period, all bets are off.

For the record, the Bureau of the Census reported that 3,708,034 room air conditioners were shipped in 1988, the latest year for which these data are available. That was an 18.6% increase over the year-previous total of 3,126,270 units.

Chillers

Although new commercial office building construction continues to be soft because of overbuilding, the combination of institutional and export markets kept chiller shipments at a high level.

Total shipments of chillers in 1989 amounted to 15,050 units. That represents a 5% increase over the 14,330 chillers shipped in the previous year.

After a sharp 18.9% increase in 1988, total shipments of centrifugal chillers, at 4,990 units in 1989, forged ahead by another 13.4% from a total of 4,400 units in 1988. And, although 1989 was the best year for centrifugals since 1975, it must be remembered that more than 30% were exported.

It should also be noted that the centrifugal totals since 1985 do not include open-type centrifugals. In the past, we have speculated that open centrifugals account for 400 to 500 domestic market units. The centrifugals also include, we suspect, a few screw compressors.

Reciprocating chillers shipped in 1989 totaled 9,800 units, dead even with the previous year's performance. The 1988 total reflected a 16.1% increase. And here again, exports accounted for more than 2,500 reciprocating chillers.

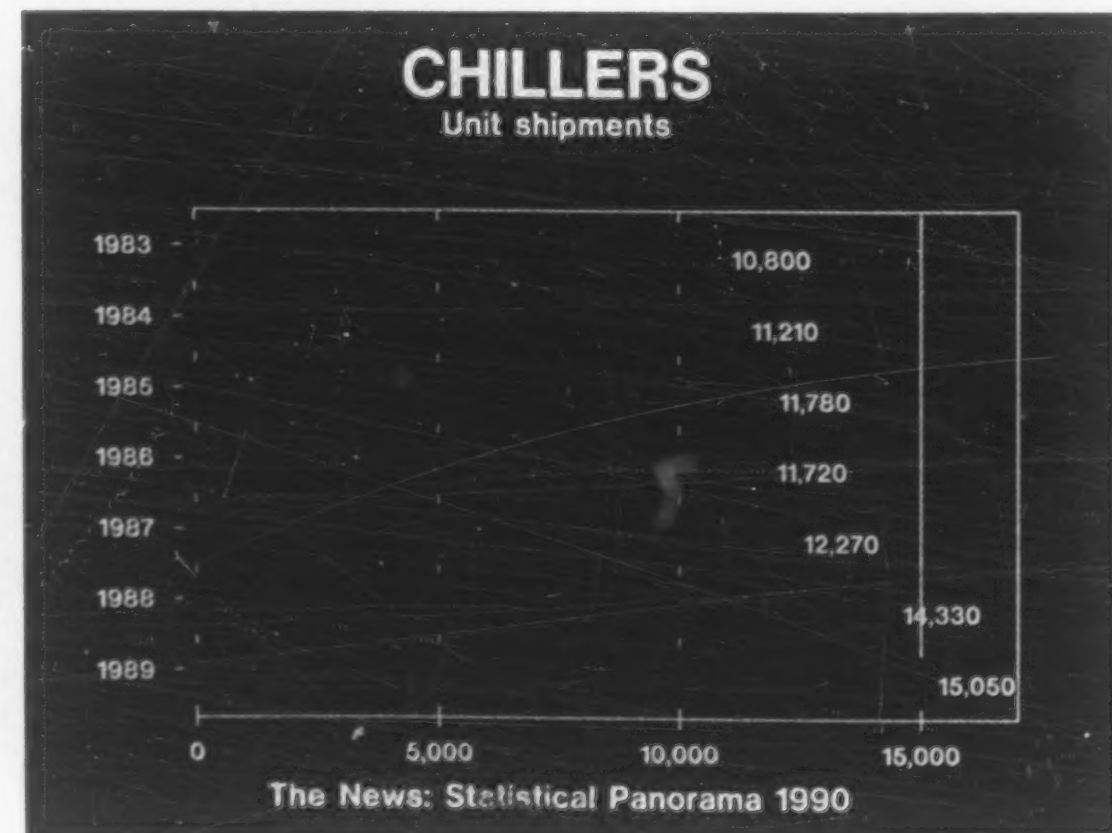
The market for absorption chillers, at 180 units in 1989, was up by 28% from the 1988 total of 130 units. Here again, almost three of 10 absorption chillers were exported.

At the end of 1989, U.S. dollar bookings for large-tonnage liquid chillers were up 65% from December, 1988, and the year-to-date total in January was up by 24%. Similarly, bookings for reciprocating liquid chillers were up 51% from December, 1988, and year-to-date bookings in January, 1990, were up by 14%.

The U.S. market for chillers, an essential ingredient in field-erected air conditioning systems, has been hampered by an overbuilt commercial office building market. Strength in the institutional and renovation-replacement markets, however, has kept the total market respectable.

Chiller manufacturers, faced with supply restrictions and an ultimate phaseout of CFC-11 and

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AIR CONDITIONING

(Continued from Preceding Page)

CFC-12, report that they now can offer machines that can accept alternate refrigerants. Although some offer HCFC-22 and R-500 as alternates, other machines are designed for use with HCFC-123 (an alternate for CFC-11) and HFC-134a (an alternate for CFC-12).

Only one manufacturer is now shipping units charged with HCFC-123. The others say they are waiting until testing is completed and the new refrigerants are available in commercial quantities in a couple of years. In the meantime, recovery-reclaim systems have been developed to reduce emissions and reclaim used refrigerants from these large machines.

For the record, the Bureau of the Census reported that 4,476 centrifugal chillers were shipped in 1988, the latest year for which these data are available. That represents a 20.1% increase over the 3,726 centrifugals the Bureau said were shipped in 1987. Again, these figures do not include open-type machines.

The Bureau reported that 15,523 reciprocating liquid chillers were shipped in 1988, an increase of 17.2% over the 13,242 reciprocating chillers the Bureau said were shipped in the previous year. Shipments of absorption refrigeration and dehydration systems in 1988 totaled 1,670 units, an increase of 18.4% over the 1,411 systems shipped in 1987.

Year	Recip.	Cent.	Abs.
1970	10,300	4,150	1,000
1971	10,000	4,000	900
1972	10,000	3,000	900
1973	10,400	4,100	800
1974	11,000	4,500	1,000
1975	8,250	4,950	700
1976	7,600	3,400	500
1977	8,900	3,000	450
1978	8,100	3,350	370
1979	8,100	3,350	280
1980	9,650	4,600	280
1981	9,250	4,300	240
1982	8,500	3,600	200
1983	7,500	3,100	140
1984	8,100	2,950	160
1985	8,160	3,490	130
1986	7,800	3,700	160
1987	8,440	3,700	130
1988	9,800	4,400	130
1989	9,800	4,990	180

Nine of 10 autos air conditioned

According to *Ward's Automotive Reports*, there were 6,995,195 air conditioning units installed on U.S. domestic automobiles in the 1989 model year, down 1% from the 7,066,056 factory air installations made in the 1988 model year.

However, U.S. domestic auto production in the 1989 model year totaled only 7,688,215 units, down 1.8% from the 1988-model year total of 7,825,586 units. That meant that, in the 1989 model year, air conditioner penetration was 90.1%, down a hair from the 1988 figure of 90.3%.

Of cars made in the U.S., almost all luxury and full-size models feature factory air conditioning as standard equipment. Some compact and subcompact autos, particularly those sold in the northern states, are ordered without air conditioning. Dealers also order a few

in standard floor plans in order to advertise lower prices.

Light trucks again demonstrated an improved appetite for air conditioning. *Ward's* reported that 3,279,420 light trucks produced in the U.S. during the 1989 model year were equipped with factory air, an increase of 10% over the previous year's total of 2,979,863 light trucks equipped with air conditioning.

Total light truck production in the 1989 model year amounted to 4,220,030 units, a 1% increase over the 4,180,179 light trucks produced in the previous model year. The penetration of air conditioning in the light truck market increased from 71.3% of the trucks produced in the 1988 model year to 77.7% in the last model year.

For the record, the Bureau of the Census reported that 9,752,154 auto air conditioning systems were shipped in 1988, the latest year for which these data are available. That represents a 19.9% drop from the 1987 total of 12,174,250 systems.

The Bureau reported that an additional 3,005,036 air conditioning systems for trucks, buses, and off-road vehicles were shipped in 1988, a 32.6% increase over the 1987 total of 2,266,282 systems. No 1988 figures were provided for recreational vehicle air conditioners. The 1987 total was 213,626 units.

The aftermarket

There are no official figures for the auto air conditioning aftermarket, which declined steadily from 1978 through 1983 and then climbed back in step with the domestic auto industry after a wrenching series of shakeouts.

The International Mobile Air Conditioning Association (IMACA) estimates that the aftermarket has stabilized in recent years at about 750,000 units. The agricultural market continues to strengthen and, just as factory air in light trucks began to increase, the medium-duty truck market has expanded for aftermarket manufacturers.

Mindful of the restricted availability of CFC-12 for automotive air conditioning, both auto companies and aftermarket manufacturers have concentrated their efforts on testing recovery-reclaim systems and developing guidelines and standards for reclaim methods

and refrigerant purity.

Autos produced in late 1992 for the 1993 model year are expected to be charged with HFC-134a, an alternative refrigerant that does not harm the earth's ozone layer.

Evaporative condensers

Shipments of evaporative condensers in 1988, the latest year for which these data are available, totaled 2,182 units, according to the Bureau of the Census. That represents an 8.4% decline from the 2,382 evaporative condensers the Bureau said were shipped in the previous year.

Of the total, the Bureau reported that 17% were under 100 tons and 83% had capacities of more than 100 tons. In fact, an increase of 7.5% among the larger units was recorded in 1988 over the previous year. The decline was among the smaller evaporative units.

Fancoil units

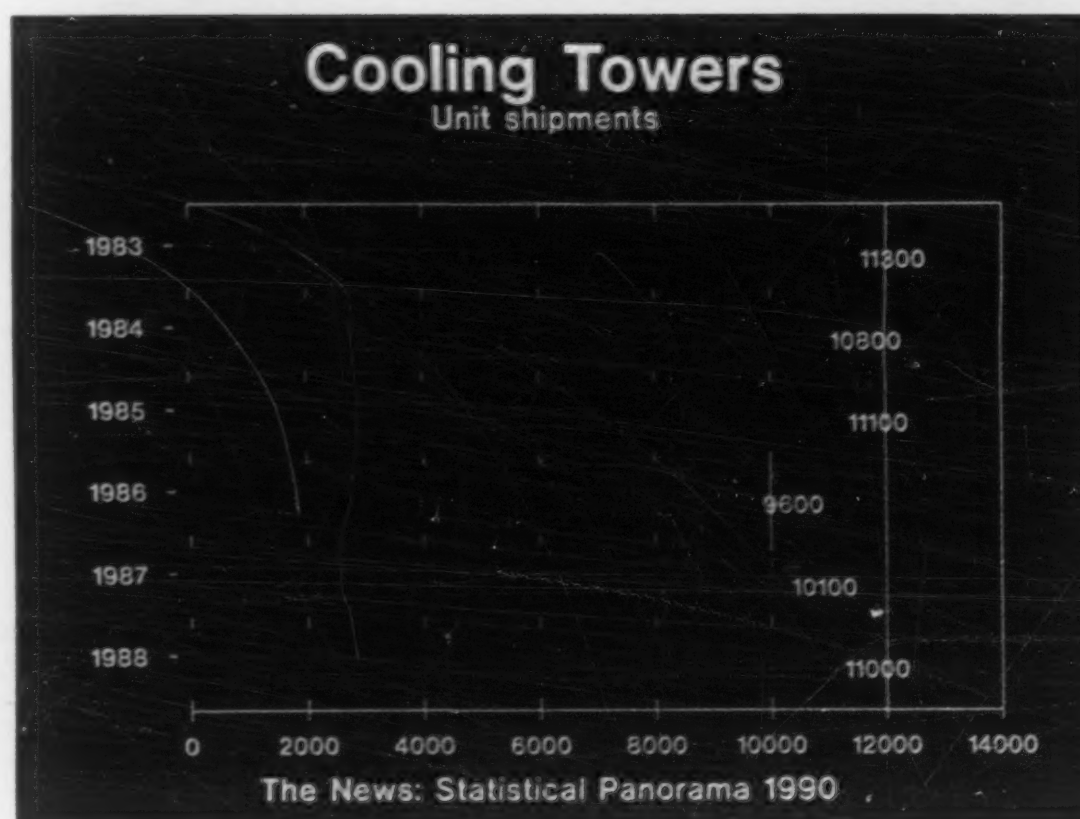
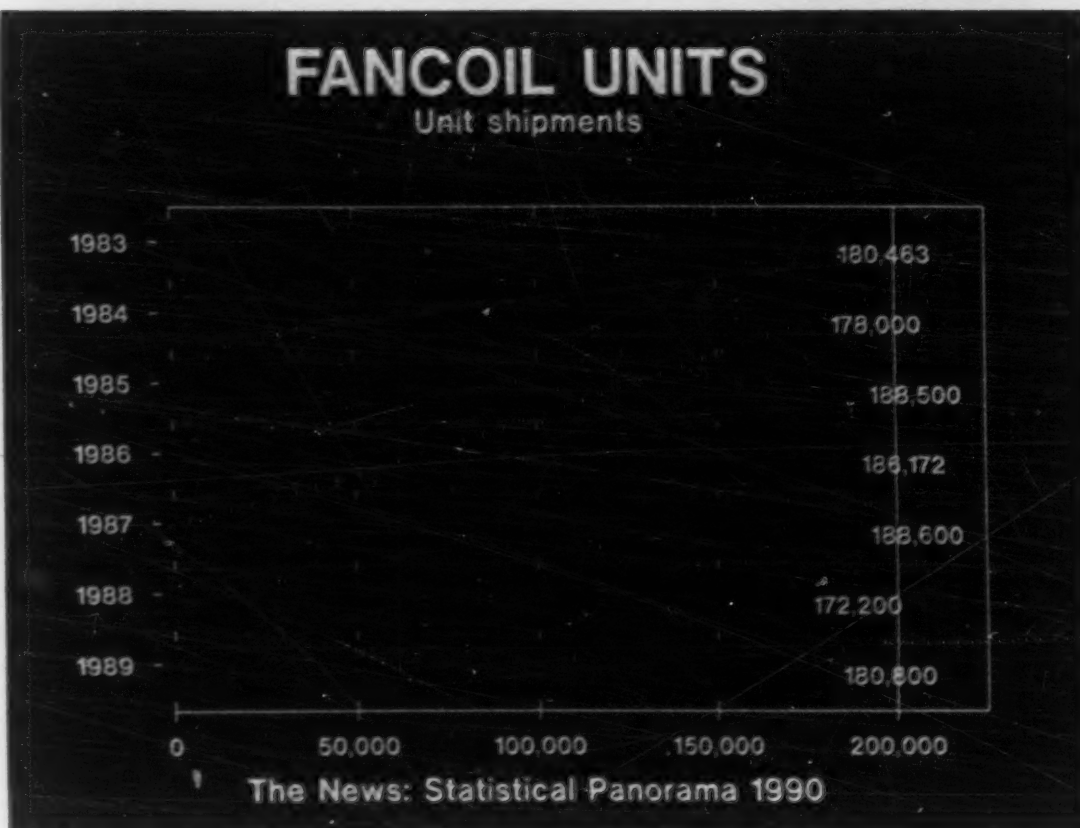
Shipments of fancoil units in 1989 totaled 180,800 units, up 5% from the 1987 total of 172,200 units, according to industry figures.

According to the Bureau of the Census, shipments of fancoil units to U.S. markets in 1988 totaled 238,992 units, an increase of 0.5% over the year-previous total of 237,804 units.

Of the units shipped in 1988, the latest year for which these data are available, 12.3% were vertical stack units, 48.5% were vertical units, and 39.2% were horizontal units.

Cooling towers

The only figures available on cooling towers are those collected by the Bureau of the Census. In 1988, the latest year for which these data are available, the Bu-



reau said 10,989 factory-fabricated water-cooling towers were shipped.

That represents a 9.2% increase over the 10,065 cooling towers the Bureau said were shipped in 1987.

Rooftops hold the line with strong replacements

Even though the light commercial market remained a bit soft in 1989, an increasing replacement market helped shipments of commercial rooftops almost hold even with the previous year's performance.

According to our calculations,

commercial rooftop shipments last year totaled 169,300 units, down only 0.5% from the 170,600 units shipped in 1988.

Shopping center and other light commercial construction tends to follow closely behind the housing market. The losses in housing starts over the past three years, however, have been largely confined to multifamily units. And the boost provided by the hot summer of 1988 was almost compensated for last year by the growing number of replacements.

The replacement market accounted for nearly half of total shipments in 1989. Not only are the rooftops installed in the 1960s and 1970s inefficient by today's standards, many of them are simply worn out. Rising utility bills also provide a strong incentive to replace old inefficient units.

Commercial rooftops really represent a market application of several different products rather than a specific product type that can be identified statistically.

For example, all-year units are identified by both ARI and the Bureau of the Census and clearly imply a heating capability. However, both single-package and split-system rooftops — though they

may have been shipped (and counted) as cooling-only units — may have a modular heating section added in the field.

Too, heat pumps imply one, and usually two methods of heating in addition to their cooling capability. Another complicating factor is that small all-year rooftops are applied in more residential than commercial situations.

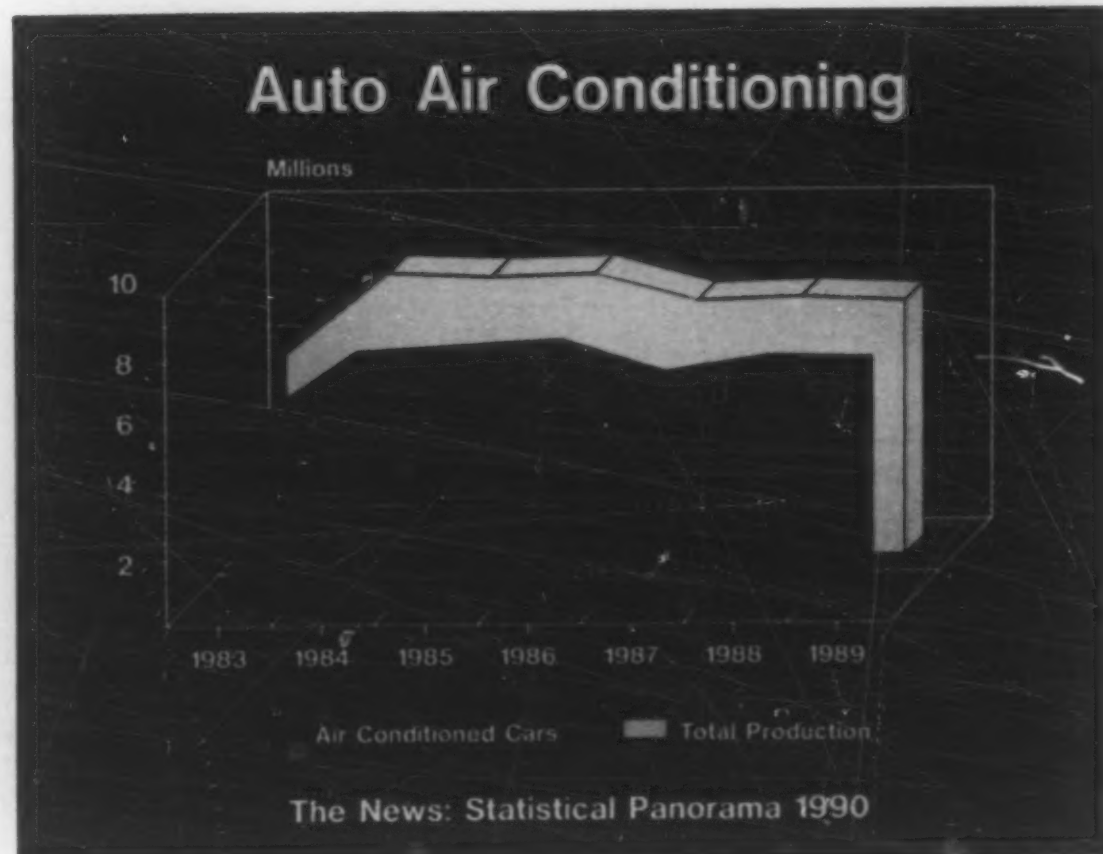
The News bases its assessment of the commercial rooftop market on the known number of unitary shipments in 1989 and 1988 of 5.4 tons or more, and by past ARI and Bureau of the Census ratios of system types and sizes and by the residential-commercial unitary split.

Although not as up to date as we would like, the exercise does produce a breakdown within a few percentage points of the latest ARI reports that break down shipments by size.

We have arbitrarily selected 5.4 tons as the starting point for commercial rooftops. We readily admit, however, that there are many commercial units smaller than that, just as there are residential units larger than 5.4 tons. But the line had to be drawn somewhere.

By applying the known — and

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AIR CONDITIONING

Our unofficial estimates of unitary market shares

When it comes to figuring shares of the unitary air conditioning market held by individual manufacturers, we must depend on "feel" rather than reliable numbers. There are no reliable numbers.

Each year the percentages shift as companies enter or leave the market, as one company is acquired by another, or as distribution and product improvements are reflected in the marketplace.

In the past year, for example, *The News* reported more than 60 mergers, acquisitions, or spinoffs involving twice that number of companies directly involved in this industry. There were a like number in 1988 and more than 80 in each of the two previous years.

It must be remembered that, like all national totals, our estimates of market share seldom will

provide an accurate picture of what is happening in any specific city or area of the country.

Some essentially regional manufacturers, with a small national market share, often are among the leaders in the areas where their distribution is concentrated.

Another distortion comes from the interest of the reader. Whether a particular manufacturer is strong in new construction, addition, or replacement sales makes little difference to many. But, for contractors who specialize, the list of competitive brands can expand or contract according to that specialty. It can also change when the contractor's interests change.

Because of these and other situations within their own cities, contractors often get a distorted view of national market shares. For

them, and for market researchers not deeply involved in the hvac industry, *The News* offers these educated guesses of unitary equipment market share in terms of units shipped:

• Carrier (including Bryant, Day & Night, and Payne) — 23%.

• Lennox (including Armstrong, Johnson, Air Ease) — 14%.

• Rheem-Ruud — 14%.

• Trane — 10%.

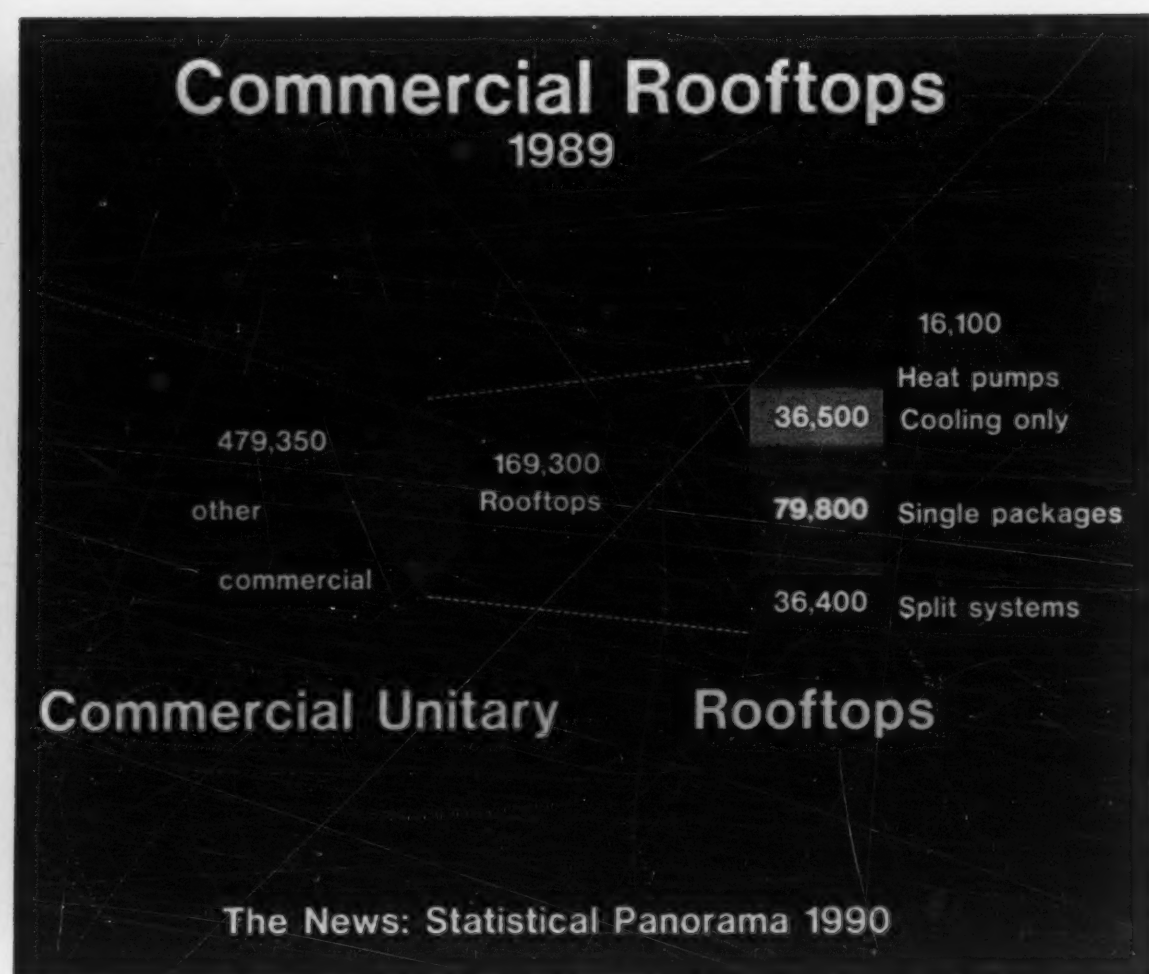
• Heil-Quaker (including Tempstar) — 9%.

• SnyderGeneral (including Arcoaire and Comfortmaker) — 8%.

• Central Environmental Systems, York International — 8%.

• Goodman (Janitrol) — 7%.

• All others — 7%.



latest — 1988 Bureau of the Census ratios to the 1988 and 1989 ARI shipment figures, we find there were 648,650 commercial units shipped in 1989, an increase of 6.8% over the 607,400 commercial units shipped in the previous year.

By applying ratios evident in the 1988 Bureau of the Census report, we also found that, in 1989:

• 148,000 were split systems, of which 36,400 were rooftops of

more than 5.4 tons. The respective 1988 totals were 135,000 and 36,600.

• 260,000 were all-year single packages, of which 79,800 were rooftops of more than 5.4 tons. The respective 1988 totals were 241,000 and 80,100.

• 115,000 were cooling-only air conditioners, of which 36,500 were rooftops of more than 5.4 tons. The respective 1988 totals were 106,000 and 36,700.

• 500 in both years were multi-zones, all of which had capacities in excess of 5.4 tons.

• 125,300 were heat pumps, of which 16,100 were rooftops of more than 5.4 tons. The respective 1988 totals were 125,200 and

16,300.

Taken together, there were 169,300 commercial rooftops with capacities in excess of 5.4 tons shipped in 1989. That leaves 479,350 commercial units with capacities less than 5.4 tons. We sus-

pect there are almost 100,000 three-phase units in that group, but further breakdowns in a segment so heavily weighted toward residential equipment are beyond our abilities.

REFRIGERATION

The continued popularity of glass-door display cases for low-temperature food preservation helped unit shipments of commercial refrigeration equipment show a 1.7% increase in 1989 over the previous year's performance, according to the Commercial Refrigerator Manufacturers Association (CRMA).

The trade association does not report numerical totals for shipments or for the various equipment categories.

Based on the percentage changes supplied by CRMA, the Bureau of the Census, and other sources, *The News* estimates that shipments in 1989 totaled 102,400 units, up 1.7% from the revised total of 100,700 units shipped in the previous year. In fact, the revisions have been carried back to 1983 (see table).

CRMA reported that shipments of standard-temperature meat display cases were down 4%, while self-service meat cases, including multidecks, were up 2.1% over the previous year's totals. These cases account for about a quarter of all unit shipments.

Shipments of produce cases were unchanged in 1989, and dairy case shipments last year increased 2.3% over the 1988 total. Standard-temperature island case shipments increased by 1.9% in 1989.

Low-temperature display cases, which make up more than one-third of commercial refrigeration shipments, increased by 3.5% last

year. CRMA reported that shipments of frozen food island cases, as well as single-deck and multi-deck open freezer cases, were down 2.7%.

However, shipments of reach-in freezer display cases with glass doors, and spot freezer display cases, increased by 9.2% in 1989 over the previous year's totals. This grouping makes up about one-fifth of total shipments.

The trade association no longer provides figures for walk-in coolers. It is, however, considering the collection of shipment and dollar figures for display cases mostly sold to convenience stores.

Equipment included would be ice cream display cases and dipping cabinets, standard-temperature reach-ins with glass doors, deli/sandwich and bakery cases, and ice merchandisers. Again, it's likely that only percentage changes will be reported by CRMA.

CFC concerns

According to a report to the Environmental Protection Agency (EPA) on the impact of the CFC (chlorofluorocarbon) phaseout, aftermarket CFC requirements for retail food refrigeration will amount to 21.47 million pounds of R-502 (a half-and-half azeotrope of HCFC-22 and CFC-115) in 1990.

Supermarkets represent only part of the estimated 1.2 million installed units using CFC-12, and the 1.6 million units using R-502

among the nation's food retailing establishments. Even so, it's a serious problem for equipment with an estimated service life of from 7.5 to 13 years.

CRMA was not successful in obtaining federal incentives to help defray the cost of converting to alternate refrigerants, but it takes some of the credit for having the ozone depletion factor of R-502 reduced from 0.3 to 0.2.

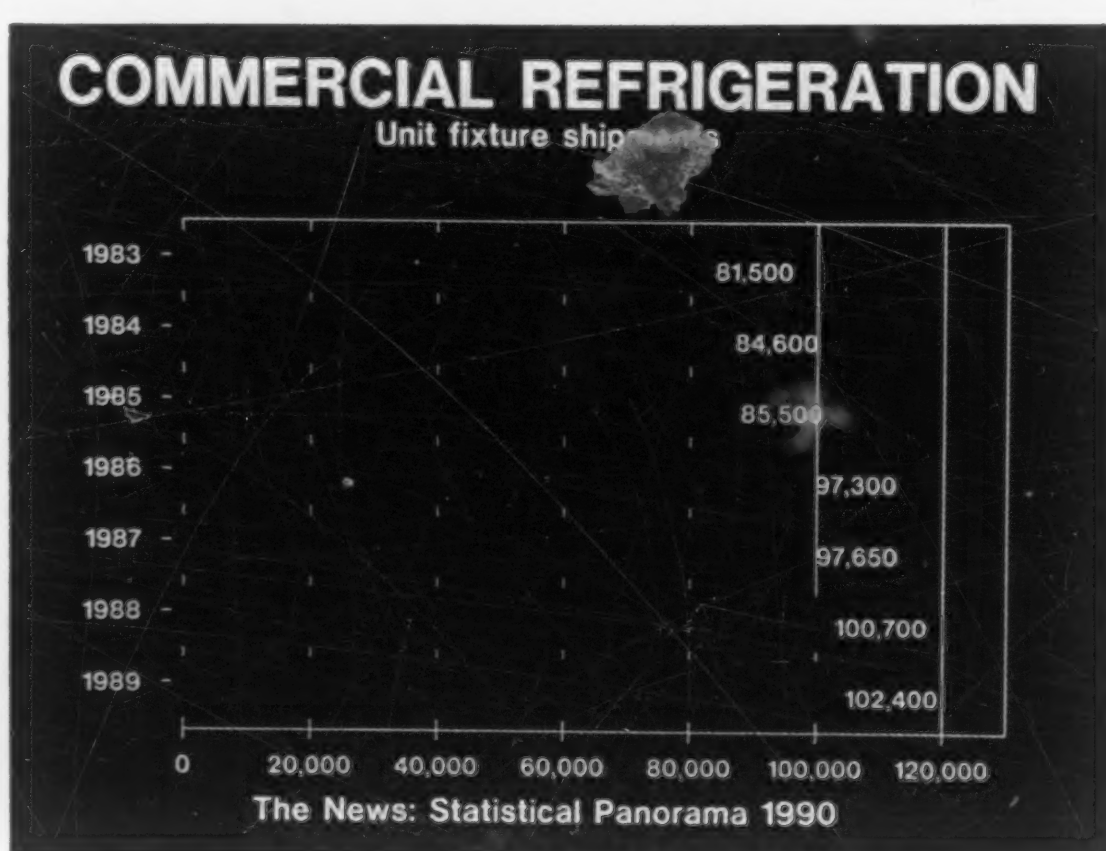
Many new and remodeled supermarkets already are switching to HCFC-22 for all food refrigeration needs. To date, most are using two-stage compressor circuiting to reach the low temperatures required for ice cream and frozen foods. However, new compressor designs just coming into the market may make it possible to achieve these low temperatures with a single-stage machine.

It should be noted, too, that many supermarket owners now forbid the venting of any refrigerant on their premises.

Sales increase

Total supermarket sales in 1988 amounted to \$240.4 billion, up 5.2% from the previous year, according to *Progressive Grocer*. Of the total, frozen foods accounted for \$14.925 billion (a 6.2% share), up nearly 5%.

Other product sales: meat \$40.98 billion (a 17% share), up 6.4%; produce \$22.625 billion (9.4%), up 7.3%; dairy products \$19.162 billion (8%), up 2.4%; ice cream \$2.294 billion (0.95%), down



1%; and deli sales \$6.114 billion (2.54%), up 11.3%. Among the biggest dollar gainers were produce, beef, poultry, deli, processed frozen meat, and prepared frozen foods.

The average shelf footage for frozen foods increased from 367 ft in 1983 to 447 ft in 1988, according to the magazine. The shelf footage for ice cream doubled from 51 ft to 102 ft over the same period, partially to make room for frozen yogurt and premium ice cream. During the past five years, retailers

have increased the amount of space allocated to frozen foods by 22%.

A look ahead

Into the 1990s, the 60,000-sq-ft superstore leads the list. Warehouse stores are in decline. And when supermarket owners talk of environmental issues, which were ranked second behind labor concerns in a *Supermarket News* poll, they mean waste disposal and the

(Page 12, Please)

REFRIGERATION

(Continued from Page 10)

recycling of bottles, cans, and cardboard.

In its look ahead at the supermarket industry, a *Progressive Grocer* panel concluded that combination stores and superstores will account for half of the market within 10 years, and that the share of conventional supermarkets will shrink from 50% today to 30% in the year 2000. The top 10 chains will have a 40% (up 10%) share of the total market and convenience stores will take 12% of sales.

They also predicted that impulse buying will increase rapidly and that sales of prepared foods, deli items, bakery goods, and specialty foods each will double over the next 10 years. The grocery share will shrink to only 30% and only half of a family's food dollar will be spent in a supermarket. The other half will be spent eating out. Half of all supermarkets will offer electronic funds scanning, and computerized inventory and space management will become routine.

Although new figures from the Food Marketing Institute will not be released for a few weeks, it's believed that the trend toward remodeling of nearly 10% of the nation's 30,400 supermarkets continues. In the early years of the past decade, the average was 6%. Higher building costs, a diminishing number of good store sites, and increased competition are among the chief reasons.

Convenience stores

For convenience stores, the 1980s brought a boom in stores offering gasoline; consolidation and competition so intense that retailers had to change their product mix, add customer services, and redesign interiors and exteriors.

In the 1990s, acquisitions will continue, says *Convenience Store News*, but the chains will stay within themselves. Competition will get even more intense, led by oil companies and large chains. There will be more emphasis on operating costs and local advertising.

Except for frozen yogurt, which is booming, frozen food sales in convenience stores have been stagnant. Total sales increased by less than 1% last year. Limited freezer space, a lack of knowledge about new products, and weak food company support provide little near-

term potential.

Some convenience store owners also fear that increased frozen food sales could come at the expense of more profitable deli sales. Premium ice cream sales also are leveling off, they report.

Bob Seng, president of Busy Bee Food Stores, Inc. (28 stores), predicted that oil companies will build the majority of new stores in the 1990s. When one oil company is successful, he says, the others join in. He estimates that up to 13,000 new convenience stores will be added in the next three to five years.

"This resulted in the overbuilding of service stations in the 1970s and, I expect, it will lead to too many convenience stores in the 1990s," he said.

At the end of 1988, there were 82,500 convenience stores nationwide with annual sales of \$82.5 billion, according to *Convenience Store News*. In-store merchandise sales totaled \$41.8 billion. Traditional operators averaged \$550,000 per year per store and petroleum companies with convenience store operations \$429,000 annually per unit.

Average sales per customer per visit in 1988, excluding gasoline, was \$3.20 at traditional sites and \$2.50 at gasoline marketer locations. Food service accounted for 15.4% of sales and 18.8% of profits at traditional locations; 14.2% of sales and 16.9% of profits at gasoline marketer sites.

The biggest revenue producer was gasoline — 520,700 gal/site annually for traditional marketers, 849,000 gal/site for gasoline marketers. The gross margin ranged from 9% to 11%. Of the total, 76% of traditional stores and 62% of gasoline marketers were open all night.

The number of stores with 3,000 sq ft or more of selling space has grown to just under 6,000 industry-wide. Food sales contributed 79% of in-store profits for traditional stores, 70.8% for petroleum marketers, non-food 18.3% and 27.1% respectively, and services 2.7% and 2.1%.

In 1989, some form of expansion was planned by 69% of traditional store operators and by 91% of petroleum marketers, the magazine reported.

Restaurants

The International Food Service Manufacturers Association

(IFSMA) has forecast 2% industry growth for 1990. This would follow 2.8% sales growth in both 1988 and 1989. The modest slowdown will affect all sectors — full service, fast food, business and industry, health care, and recreation.

There will be pockets of accelerated growth among convenience stores, colleges and universities, prisons, cruise ships, child care centers, and food service in taverns. Overall, food service sales of \$244.9 billion are forecast for 1990, up from \$230.5 billion in 1989.

Commercial operations will increase by 2.2% to \$174.3 billion in 1990 (the increase was 3% in 1989) and non-commercial operations will gain 1.5% in 1990, slower than the 2.2% increase in 1989. Saturation is becoming a problem. There are now 2,700 people for every restaurant, down from 7,000 per restaurant a decade ago. Alcohol sales are not included in the IFSMA figures.

According to the National Restaurant Association (NRA), sales of away-from-home meals will grow by 1.8% in 1990, up slightly from the 1.5% increase last year. Competition, particularly from casual full-service restaurants, will intensify.

NRA predicted that labor costs will escalate by 5% in 1990, up from 4.4% in 1989, but that food costs will increase by only 3.5% this year compared to 5.1% in 1989. In all, the total food service industry expects 1990 sales to total \$241.28 billion.

The NRA food service industry 1990 forecast breaks down this way: fast-food restaurants \$70.38 billion; full-service restaurants \$77.19 billion; ice cream/frozen treat outlets \$2.18 billion; commercial cafeterias \$4.36 billion; social caterers \$2.25 billion; bars and taverns \$9 billion; food contractors \$14.61 billion; and institutional food service \$26.21 billion.

What's ahead: more casual dining; more shakeouts and takeovers of chains; more convenience with drive through takeout, and home delivery; and an eye toward the global market. Upscale restaurants are discovering a growing market for organic and health foods.

Refrigerators

Home refrigerator shipments totaled 7,098,800 units in 1989, a

UNIT COOLERS

Unit shipments



The News: Statistical Panorama 1990

1.8% decline from the 7,227,000 refrigerators shipped in the previous year, according to the Association of Home Appliance Manufacturers (AHAM).

Even with the decline, AHAM reported that refrigerator shipments approached a record high. A record was established for November refrigerator shipments and December showed a 5.8% increase. Overall, however, AHAM expects shipments of major home appliances to be flat in 1990.

Shipments of home freezers in 1989 totaled 1,218,600 units, a drop of 9.6% from the 1,348,700 home freezers shipped in the previous year.

The 1989 breakdown shows 677,400 (or 55.6%) were chest-type freezers, down 6.8% from the 726,600-unit total for 1988, and 541,200 (or 44.4%) were upright freezers, down 13% from the 622,200 upright freezers shipped in 1988.

As with all of AHAM's public statistics, the figures include both products made in the United States and those imported from other nations.

Unit coolers

Shipments of unit coolers, at 140,500 in 1989, held virtually even. The decline from the 1988 total of 141,200 units was only 0.5%.

It should be noted that the Bureau of the Census reported that 205,558 unit coolers were shipped

in 1988, the latest year for which these data are available. This represents a 2.6% increase over the 200,296 unit coolers the Bureau said were shipped in the previous year.

The industry figures do not include exports or the production of several significant manufacturers.

Ice-makers

Commercial ice-maker shipments in 1989 totaled 147,200 units, down 6% from the previous year's total of 156,600 units. *The News* believes that about 75% were cubers, 20% were flakers, and 5% were combination ice-makers and dispensers.

For two years in Statistical Panorama, we added another category, ice-maker/dispenser combinations, but our estimates did not even come close to the numbers reported by the Census Bureau. Industry observers believe that the government numbers include many small residential ice-makers that are not included in industry totals.

The Bureau of the Census reported that 253,927 ice-makers were shipped in 1988, the latest year for which these data are available. This represents a 4.3% increase over the 243,572 ice-makers the Bureau said were shipped in the previous year.

Both sets of numbers include both domestic and export shipments.

ICE-MAKING MACHINES

Unit shipments



The News: Statistical Panorama 1990

HEATING

Despite a 7.4% dip in single-family home starts last year, replacements of worn-out equipment, and the movement to upgrade operating units for reasons of efficiency, carried gas furnace shipments to a new record in 1989.

Shipments of gas furnaces last year totaled 2,162,185 units, a 3.3% increase over the 2,092,165 gas furnaces shipped in 1988, according to the Gas Appliance Manufacturers Association (GAMA).

Last year's performance was 2.7% better than the previous rec-

ord of 2,104,805 units shipped in 1986 and the fourth year in a row that gas furnace shipments topped the 2-million mark. In fact, the previous 2-million year prior to those four was back in 1972.

The strength of the replacement and upgrade markets continues to hold up gas furnace shipments in the face of three years of single-family home start declines and relatively mild winters. Last December's extended cold snap came too late to materially affect 1989 shipments.

It is significant to note, however,

that home starts in the prime Midwest and West gas furnace markets declined by less than half of the national average.

As this is written, GAMA had not released its annual breakdown of gas and oil furnace shipments by efficiency. These numbers will be contained in *Comfort in Construction* elsewhere in this issue. Even so, we're confident that more than one-third of the furnaces shipped last year had efficiencies above the 78% AFUE (annual fuel utilization efficiency) federal mini-

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INTERNATIONAL

Even though imports of air conditioning and refrigeration equipment and components into the United States increased by nearly 30% last year, a 27% increase in the larger export base widened the industry's positive trade balance. Still, however, it was more than \$1 billion short of the \$1.8 billion trade surplus recorded eight years earlier.

More than half of the 1989 imports were in two categories — \$943.5 million worth of compressors and \$221.8 million worth of room air conditioners. These imports were offset, in part, by U.S. export compressors worth \$395.5 million and \$140 million worth of room unit exports.

According to the Department of Commerce, U.S. exports in 1989 totaled \$2,664,792,000, an increase of \$571,622,000, or 27.3%, over the previous year's total of \$2,093,170,000.

U.S. imports last year totaled \$1,918,719,000, up \$441,853,000 or 29.9% from the 1988 total of \$1,476,866,000. The positive U.S. balance of trade, at \$746,073,000 in 1989, was up \$129,769,000 or 21% from the year-previous positive trade balance of \$616,304,000.

Imports last year represented 72% of exports, up from 70.5% in 1988 but down from the 80% recorded a year earlier. In 1981, total imports of \$273.8 million represented only 13.2% of exports.

The total of 12.3-million air conditioning and refrigeration compressors imported into the U.S. last year was about on a par with the totals for the previous two years. (Because the 1988 figures for compressors of 0.25 hp or less were missing from the report, we could not make an absolute comparison.) If the 4.8 million imported auto air conditioning compressors are added to the 1989 total, the number of all types of compressors totals 17.1 million.

There were 192,700 fewer room air conditioners imported into the U.S. last year. Room air conditioner imports last year totaled 895,136 units, down 17.7% from the 1988 total of 1,087,875 units. It was the first decline for room unit imports since 1983 when the total was only 98,000 units.

There are many reasons for the continued increases in imported equipment and components. In addition to foreign companies seeking to initiate or expand U.S. market opportunities, two U.S. compressor manufacturers and a pair of room unit manufacturers have

moved all or part of their production offshore so they can better compete in world markets.

Although the dollar declined against other major currencies for nearly three years, it appreciated about 4% since mid-1989. The fluctuations have had little effect on the Japanese, who captured 49% of U.S. imports in 1987, 46% in 1988, and 45% in 1989. One Japanese manufacturer also plans to build a major compressor plant in the U.S.

Free trade

It should be noted that, in 1988, Canada and the U.S. ratified a free trade agreement aimed at removing tariffs on air conditioning, heating, and refrigeration equipment and components over a 10-year span. Canada continues to be the best customer for U.S. exports even though its share keeps shrinking as other exports grow.

It should also be noted that, in 1989, imports from Canada into the U.S. doubled from \$72.5 million in 1988 to \$144.8 million last year. U.S. exports to Canada, however, totaled \$650 million in 1989.

Monthly statistics for 1989 were delayed because of the changeover to the international Harmonized Commodity Classification System (HS). Previously, the Commerce Department used the Tariff Schedule of the U.S. Annotated (TSUSA) for imports and Schedule B of the Bureau of the Census for exports.

The new classification system is expected to bring data more in line with SIC (standard industrial code) 3585 — Air Conditioning and Refrigeration Equipment, Including Warm Air Furnaces. This is the report used by *The News* for our 10-year look at shipments elsewhere in this issue.

The change has meant that several new import categories have become available. They include self-contained air conditioners under 60,000 Btuh, self-contained air conditioners over 60,000 Btuh, year-round air conditioners under 60,000 Btuh, year-round air conditioners over 60,000 Btuh, room fancoil units, and central station air handlers.

Import data also is available for several additional refrigeration categories, including heat exchangers, automatic commercial ice makers, drinking water coolers, and refrigeration condensing units.

Also, information is accessible for several commercial refrigeration export categories which were

previously available only on the import side. They include compression-type refrigerator-freezers, chest-type freezers, freezer display cases, refrigerated display cases, finned-coil heat exchangers, and other heat exchangers.

It must be remembered that these figures only represent shipments. They do not take into account the profits of U.S. companies from subsidiaries, joint ventures, and licensing agreements that are not reinvested abroad.

Major markets

A look at major export markets would not be complete without an advance look at the European Economic Community's (EEC's) plans to remove all tariff and nontariff barriers to trade within the 12-nation group in 1992.

Although the details are far from complete, the plan promises to open up the European market to free trade. Many U.S. companies have been established in Europe for many years and U.S. trade associations and technical societies are cooperating on the development of performance and rating standards that could be adopted by the EEC.

The prospect of easier trading in Western Europe has been given an added boost by the political developments in recent months in Eastern Europe, including the Soviet Union. Although not expected to develop overnight, markets in Eastern Europe are expected to develop exponentially over the next five years. The problem is not need. It is a means of payment that will take time to develop.

In 1989, for the seventh year in a row, Canada was the leading export market for U.S. air conditioning and refrigeration equipment and components. The \$650,042,000 worth of exports to Canada, or 24% of the total, represented a 12% increase in shipment value (from \$577,987,000 in 1988) but a drop in total market share from 28% a year earlier.

The Middle East, which had been the leading export market for many years, accounted for only 10% of the total last year, or \$256,184,000. That market increased marginally from \$252,488,000 in 1988, when its share of the total market was 12%.

The Western Europe export market increased by \$128.2 million in 1989 to \$529,109,000 and its share of the total increased from 19% to 20%. The percentage increase last year over 1988 was 32%.

Although its world market share slipped from 15% in 1988 to 14% last year, the Central and South American market increased by 23%, or \$70.6 million, to \$376,011,000 in 1989. The previous year's total was \$305,418,000.

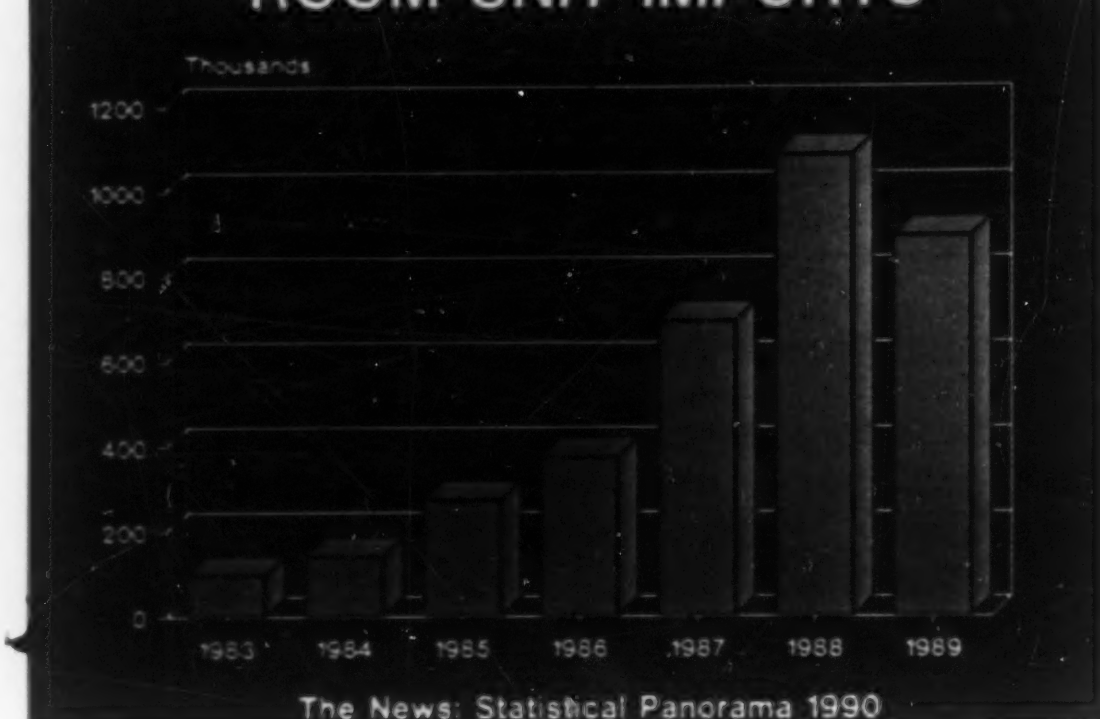
The Far East, with an increase of \$284.1 million in the value of shipments to \$792,007,000 last year, also increased its world market share from 24% in 1988 to 30%. That's double the share — and three times the export value — of 1984 export shipments. The 1988 total was \$507,846,000.

Exports to African nations increased from \$47,772,000 in 1988 to \$56,569,000 last year, or 18%, but its world market share of U.S. exports remained constant at 2%.

Imports

According to the Department of

ROOM UNIT IMPORTS



Commerce, eight nations accounted for \$1.678 billion, or 87%, of the \$1,918,719,000 worth of air conditioning and refrigeration equipment and components imported into the U.S. in 1989.

Of the total 1989 imports:

- **\$858.1 million came from Japan**, up 37.9% from \$622.4 million in 1988, which mostly included 1,079,133 compressors of 0.25 hp or less, 1,419 screw compressors, 4,620,549 motor vehicle air conditioning compressors, 1,686,729 compressors of from 0.25 to 1 hp, 326,881 compressors of from 1 to 3 hp, 38,192 compressors of from 3 to 10 hp, 2,319 compressors over 10 hp, 88 ammonia compressors, 42,090 room air conditioners, 9,640 self-contained heat pumps, 2,813 split-system air conditioners, 16,977 evaporators with refrigeration coil, 349 room fancoil units, 739 central station air handlers, 1,352 room terminal units, 119,195 auto air conditioners, 33,836 condensing units, 112,512 heat exchangers, \$143,074,000 worth of auto air conditioning parts, \$192,000 worth of heat pump parts, \$12,723,000 worth of air conditioning parts, 1,065 refrigerator-freezers, 43,114 absorption refrigerators, 482 freezer display cases, 438 refrigerated display cases, 24,254 ice makers, and 3,482 refrigeration condensing units.

- **\$180.4 million came from Singapore**, up 16.5% from \$155 million in 1988, which mostly included 1,657,383 compressors of 0.25 hp or less, 3,200 motor vehicle air conditioning compressors, 977,769 compressors of from 0.25 hp to 1 hp, 1,200 compressors of from 1 hp to 3 hp, 185,098 room air conditioners, 65,577 self-contained heat pumps, 3,935 split-system air conditioners, 255 room terminal units, and \$3,441,000 worth of air conditioner parts.

- **\$179.7 million from Mexico**, up 59.6% from \$112.6 million in 1988, which mostly included 3,175 compressors of 0.25 hp or less, 169,065 motor vehicle air conditioning compressors, 22 ammonia compressors, 28,679 room air conditioners, 421 self-contained heat pumps, 3,479 all-year air conditioners, 519,317 evaporators with refrigeration coils, 21,445 condensing units, \$37,431,000 worth of auto air conditioning parts, \$12,920,000 worth of heat pump parts, \$37,992,000 worth of air conditioning parts, 53,759 refrigerator-freezers, 4,799 chest freezers, 8,572 upright freezers, 46 freezer display cases, 238 refrigerated display cases, 17,296 fin-coil

heat exchangers, 43,523 other home freezer or refrigerator and 39,879 refrigeration condensing units.

- **\$144.8 million from Canada**, up 99.6% from \$72.6 million in 1988, which mostly included 388,531 compressors of 0.25 hp or less, 53 screw compressors, 454,641 compressors of from 0.25 hp to 1 hp, 111 compressors of from 1 hp to 3 hp, 414 compressors of from 3 hp to 10 hp, 134 compressors over 10 hp, 23,003 room air conditioners, 436 self-contained heat pumps, 319 all-year air conditioners, 455 evaporators with refrigeration coils, 5,042 room terminal units, 2,874 dehumidifiers, 1,795 other air conditioners, 663 auto air conditioners, 4,159 heat exchangers, 39,244 air conditioners without refrigeration units, \$5,370,000 worth of auto air conditioning parts, \$18,000 worth of heat pump parts, \$14,598,000 worth of air conditioner parts, 317 refrigerator-freezers, 220 absorption refrigerators, 108,632 chest freezers, 703 upright freezers, 23 freezer display cases, 3,332 refrigerated display cases, 107 ice makers, 3 centrifugal chillers, 198 absorption chillers, and 478 refrigeration condensing units.

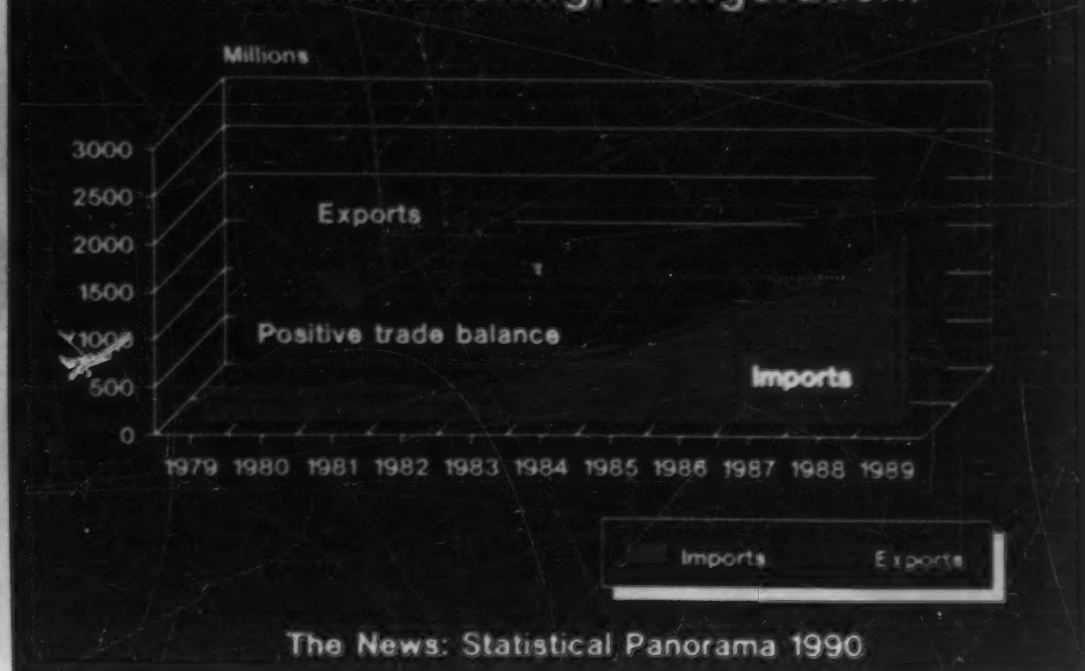
- **\$128.2 million from Brazil**, up 1.4% from \$126.5 million in 1988, which mostly included 2,176,545 compressors of 0.25 hp or less, 5,680 screw compressors, 1,500 compressors for motor vehicles, 580,856 compressors of from 0.25 hp to 1 hp, 5,117 compressors of from 3 hp to 10 hp, 2,115 compressors over 10 hp, 26 ammonia compressors, 162,707 room air conditioners, \$458,000 worth of auto air conditioning parts, \$921,000 worth of air conditioning parts, 4,396 refrigerator-freezers, 1,058 absorption refrigerators, 416 upright freezers, 440 refrigerated display cases, and 4,103 other home refrigerators.

- **\$90.1 million from Italy**, up 60% from \$56.3 million in 1988, which mostly included 1,038,787 compressors of 0.25 hp or less, 299 screw compressors, 527,832 compressors of 0.25 hp to 1 hp, 2,069 compressors of from 1 hp to 3 hp, 10,351 room air conditioners, 423 other air conditioners, 1,044 auto air conditioners, \$874,000 worth of air conditioning parts, 1,235 refrigerator-freezers, 4,254 chest-type freezers, 2,304 upright freezers, 1,065 freezer display cases, 2,591 refrigerated display cases, 271 ice makers, and 61 centrifugal chillers.

- **\$57.2 million from South Korea**, down 49.6% from \$113.4 million in 1988.

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TRADE BALANCE (air conditioning, refrigeration)



INTERNATIONAL

Major export markets

U.S. air conditioning, refrigeration equipment (values in millions)

Market	— 1985 —		— 1986 —		— 1987 —		— 1988 —		— 1989 —	
	Value	% of total	Value	% of total	Value	% of total	Value	% of total	Value	% of total
Canada	534	38	459	34	556	34	578	28	650	24
Central, South America	193	14	234	18	264	16	305	15	376	14
Western Europe	236	16	251	19	287	18	401	19	529	20
Far East	225	16	217	16	297	18	508	24	792	30
Middle East	175	12	140	11	174	11	253	12	256	10
Africa	41	3	28	2	37	2	48	2	57	2
Other	10	1	2	0	0	1	0	0	5	0
Total	1,414	100	1,331	100	1,615	100	2,093	100	2,660	100

(Continued from Page 13)

lion in 1988, which mostly included 142 screw compressors, 14,800 air conditioning compressors for motor vehicles, 139,677 room air conditioners, 673 self-contained heat pumps, 2,247 split-system air conditioners, 29,387 dehumidifiers, 6,720 other air conditioners, 3,080 auto air conditioners, 2,102 condensing units, 512 air conditioners without refrigeration unit, \$7,730,000 worth of air conditioner parts, 28,613 refrigerator-freezers, 7,084 absorption refrigerators, 430 chest-type freezers, 342 freezer display cases, 167 refrigerated display cases, 236 absorption chillers, and 16,008 other home refrigerators.

• **\$38.8 million from West Germany**, up 12.7% from \$34.4 million in 1988, which mostly included 2,700 compressors of 0.25 hp or less, 333 screw compressors, 2,012 air conditioning compressors for motor vehicles, 559,722 compressors of from 0.25 hp to 1 hp, 337 compressors of from 3 hp to 10 hp, 21 compressors over 10 hp, 442 room air conditioners, 249 split-system air conditioners, 294 room terminal units, 278 dehumidifiers, 735 auto air conditioners, 154 condensing units, \$3,632 worth of auto air conditioning parts, \$64,000 worth of heat pump parts, \$2,168,000 worth of air conditioner parts, 685 absorption refrigerators, 270 chest-type freezers, 540 freezer display cases, 261 refrigerated display cases, and 363 other home refrigerators.

Screw compressors also came from Denmark (2,862) and France (403). Compressors under 10 hp also came from Malaysia (736,942), France (15,254), and Taiwan (7,100). Compressors over 10 hp also came from Belgium (5,866), Denmark (3,289), and Sweden (707). Room air conditioners also came from Malaysia

(253,520), and Israel (5,759).

Of air conditioners without a refrigeration unit, Taiwan supplied 31,325, Australia 21,340, and China 3,170. Hong Kong supplied 12,344 absorption refrigerator-freezers and Yugoslavia supplied 16,487 chest-type freezers and 34,320 upright freezers.

Other freezer display case suppliers included Denmark with 11,584, Austria with 625, Britain with 539, and Costa Rica with 299. Other refrigerated display cases came from Britain (1,540) and Denmark (470). Sweden supplied 4,754 absorption chillers.

Exports

In terms of products exported from the United States, the Department of Commerce prepares a country-by-country breakdown for most of the product categories contained in the SIC 3585 classification. Although we do not have space to list the complete breakdown, a feel for the top export markets of 1989 can be gained by looking for key products and top customer countries.

The following breakdown provides the 1989 total for each category and the total for 1988 in parentheses were available:

Compressors of 3 hp or less — 1,771,901 units (1,530,043 in 1988); Saudi Arabia 433,374; Canada 221,916; Thailand 169,426; Japan 136,312; Brazil 116,307; Israel 71,384; and South Korea 67,642.

Compressors from 3 hp to 10 hp — 204,444 units (235,823 in 1988); Saudi Arabia 28,903; Thailand 28,217; Mexico 26,176; Kuwait 11,317; and Canada 10,085.

Compressors over 10 hp — 32,454 units (33,074 in 1988); France 6,550; Canada 2,684; Britain 2,243; Australia 2,055; Thailand 2,013; South Korea 1,703;

Taiwan 1,666; Malaysia 1,665; and Argentina 1,616.

Screw compressors — 9,124 units (no 1988 comparison); Canada 3,550; Italy 2,019; Venezuela 1,033; Dominican Republic 578; Colombia 244; and Belgium 216.

Ammonia compressors — 9,416 units (2,138 in 1988); Japan 3,516; United Arab Emirates 1,180; France 1,106; Taiwan 864; Australia 560; and Canada 386.

Auto and truck refrigeration and air conditioning compressors — 272,408 units (273,223 in 1988); Mexico 53,412; Japan 48,014; Canada 38,225; Britain 16,987; Argentina 16,689; Italy 15,433; and South Korea 12,057.

Parts for refrigeration and air conditioning compressors — \$70,017,000 (\$53,356,000 in 1988); Mexico \$14,400,000; Belgium \$8,923,000; Canada \$6,165,000; France \$4,467,000; Brazil \$2,551,000; Taiwan \$2,485,000; Venezuela \$2,262,000; and Denmark \$2,360,000.

Room air conditioners under 10,000 Btuh — 163,919 units (52,900 in 1988); Taiwan 66,998; Canada 18,947; Hong Kong 16,873; Philippines 11,650; Mexico 6,808; Belgium 5,223; West Germany 4,089; and Israel 3,117.

Room air conditioners from 10,000 Btuh to 17,000 Btuh — 133,162 units (79,919 in 1988); Taiwan 69,596; Hong Kong 13,843; Mexico 13,114; Canada 12,491; and Nigeria 2,499.

Room air conditioners over 17,000 Btuh — 115,564 units (98,594 in 1988); Taiwan 38,459; Britain 13,346; Hong Kong 10,630; Mexico 9,409; Kuwait 8,863; Canada 4,664; and United Arab Emirates 2,784.

Self-contained heat pumps — 54,201 units (26,897 in 1988); Canada 9,071; West Germany 8,712; Turkey 8,646; Mexico 3,289; Cayman Islands 2,052; United Arab

Emirates 1,619; Kuwait 1,469; and Lebanon 1,365.

Split-system heat pumps — 51,122 units (30,992 in 1988); Canada 18,489; Mexico 8,581; Taiwan 2,665; France 2,492; Jordan 2,136; and Britain 1,526.

Split-system air conditioners — 62,424 units (no 1988 comparison); Canada 32,933; Taiwan 10,288; Saudi Arabia 1,963; and Mexico 1,930.

All-year heating-cooling packages — 31,896 units (45,421 in 1988); Canada 18,168; and Mexico 2,561.

Self-contained air conditioners — 108,011 units (57,813 in 1988); Canada 54,113; Saudi Arabia 6,699; Mexico 6,214; United Arab Emirates 5,902; Australia 3,315; Hong Kong 3,109; Singapore 2,402; and France 2,147.

Room fancoil units — 31,336 units (38,256 in 1988); Canada 8,535; Saudi Arabia 3,735; Mexico 2,489; South Korea 1,890; El Salvador 1,287; Belgium 1,245; and Egypt 1,199.

Central station air handlers — 5,480 units (4,438 in 1988); Canada 1,238; Hong Kong 759; Lebanon 701; Singapore 606; and Mexico 391.

Room terminal units — 33,890 units (no 1988 comparison); Mexico 4,542; Australia 4,143; Hong Kong 4,188; Canada 4,024; and Saudi Arabia 3,736.

Automotive air conditioners — 2,658,636 units (no 1988 comparison); Canada 2,473,199; Mexico 38,945; West Germany 27,606; Saudi Arabia 18,052; Britain 17,121; Singapore 13,450; Spain 11,492; and France 11,319.

Condensing units 60,000 Btuh and under — 79,179 units (73,732 in 1988); Canada 26,854; United Arab Emirates 9,849; Saudi Arabia 8,414; France 7,574; Taiwan 2,676; and Mexico 2,552.

Condensing units over 60,000

Btuh — 43,108 units (10,458 in 1988); Canada 37,524; and United Arab Emirates 1,363.

Of the \$415,898,000 **air conditioning machinery parts** (\$305,471,000 in 1988), Canada accounted for \$121.2 million, Mexico \$46.7 million; West Germany \$38.1 million; Saudi Arabia \$32.7 million; Britain \$19.8 million; and Australia \$13 million.

Freezer display cases — 19,301 units (no 1988 comparison); Kuwait 3,004; Canada 1,948; Britain 1,754; Netherlands 1,598; Japan 1,443; United Arab Emirates 1,090; South Korea 1,035; and Australia 1,005.

Refrigerated display cases — 55,287 units (no 1988 comparison); Canada 8,582; South Korea 8,209; Japan 7,142; Britain 3,389; Mexico 3,178; Taiwan 2,272; Bermuda 1,723; Philippines 1,695; Saudi Arabia 1,585; Spain 1,548; China 1,102; and Hong Kong 1,072.

Ice-making machines with capacities under 500 lb — 17,282 units (no 1988 comparison); Canada 4,101; Taiwan 2,363; Mexico 2,004; and France 1,031.

Other ice makers — 13,025 units (no 1988 comparison); Taiwan 3,668; and Canada 1,891.

Centrifugal open-type liquid chillers — 513 units (1,032 in 1988); South Korea 157; Japan 86; Sweden 50; Jamaica 34; Nigeria 31; Algeria 22; and Taiwan 22.

Centrifugal hermetic liquid chillers — 1,010 units (351 in 1988); Canada 238; Venezuela 215; Colombia 190; and Taiwan 122.

Absorption liquid chillers — 4,713 units (831 in 1988); Canada 4,029; Japan 238; Belgium 60; and South Korea 57.

Reciprocating liquid chillers — 2,893 units (902 in 1988); Taiwan 652; Canada 516; France 237; Japan 220; Saudi Arabia 163; and South Korea 149.

HEATING

(Continued from Page 12)
mum that will become mandatory in 1992.

In November 1989, GAMA's members forecast that 1990 shipments of gas furnaces would total 2,148,400 units, or a hair less than last year's performance. With the benefit of three months' extra hindsight, we believe they are too conservative. We see another 3%

gain this year to 2,225,000 units.

For the record, the Bureau of the Census reported that 1,926,869 gas furnaces were shipped in 1988, the latest year for which these data are available. This represents a 9.2% increase over the revised 1987 total of 1,765,007 units. The Census Bureau also noted that 961 gas-fired gravity furnaces were shipped in 1988, a 41.2%

drop from the 1,635 gravity furnaces shipped in 1987.

Here and elsewhere in this issue we'll report Bureau of the Census figures where they are available, even though they often vary considerably from industry figures. We favor the industry figures because they are more up-to-date and, in our opinion, are developed by people closer to the market.

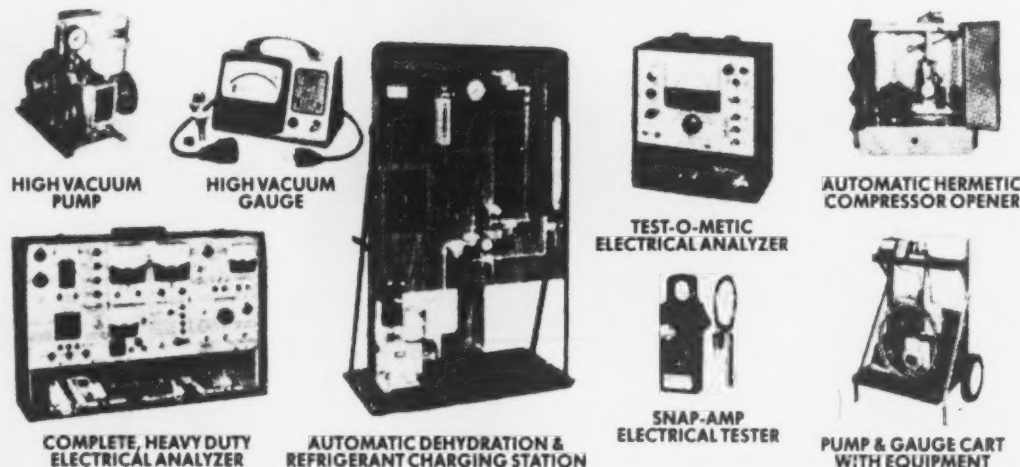
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Circle 3

Soft Northeast hits oil market

Although oil's share of the key Northeast market has suffered little in recent years, the decline in new home construction in that region since 1986 finally caught up with oil furnace shipments in 1989.

Shipments of oil furnaces in 1989 totaled 178,980 units, a decline of 12.2% from the 203,785 oil furnaces shipped in the previous year, according to GAMA. Even so, the drop was only half of the 24% decline in new home starts in the Northeast.

Replacements have been a major factor in the oil furnace market for many years. But even that market was rocked in late 1989 with the spurt in oil prices that topped out at \$1.37/gallon. While oil prices have dropped by nearly 25% since, it remains to be seen what effect it will have on consumer new home and replacement choices.

It should be noted that 80% of the nation's oil-fired home heating systems are located in the Northeast and that almost 90% of them were installed prior to 1964. In the early 1980s, when oil prices skyrocketed, there was a scramble to convert to other fuels. But with moderating oil prices and continuing high electricity costs in the region, oil has regained much of its lost market share.

Oil furnaces should have no difficulty meeting the 1992 federal efficiency minimums. In 1988, more than two-thirds of oil furnaces shipped had AFUEs of 80% or more. And virtually all of the replacement burners fitted to older furnaces are retention head or other high-efficiency types.

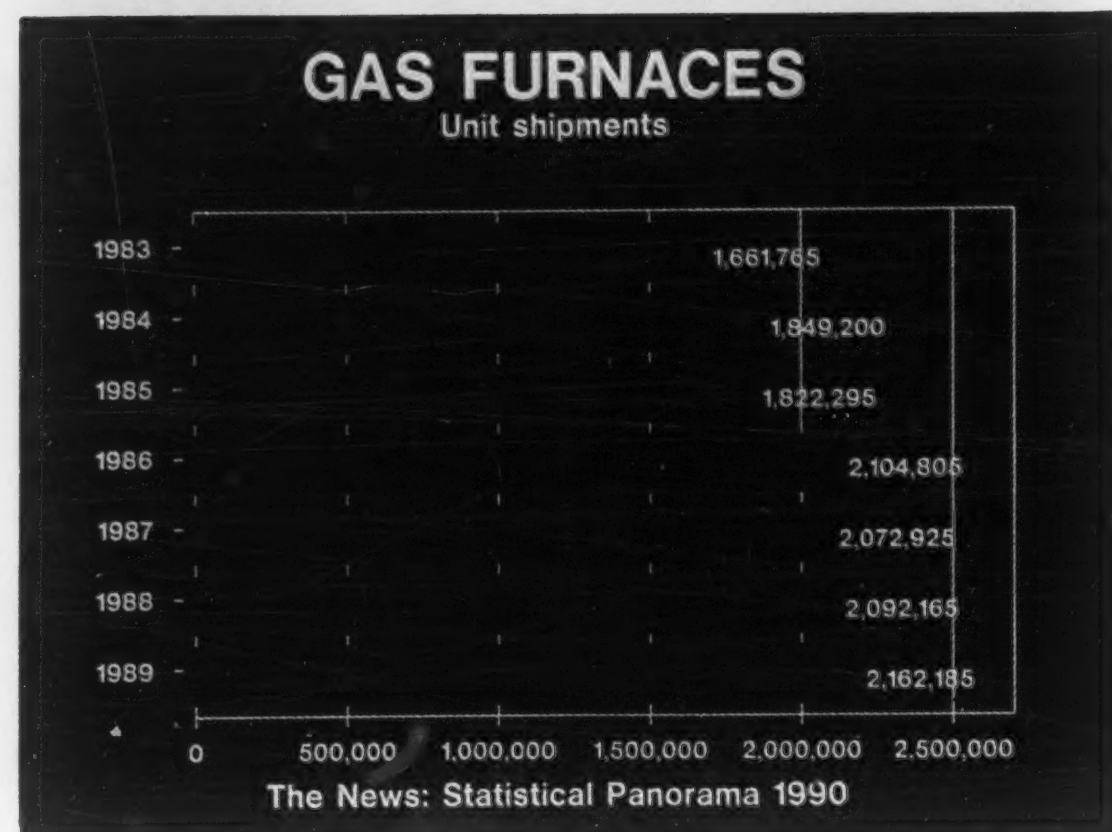
GAMA's members feel oil furnace shipments in 1990 will increase by 3% to 184,200 units. We disagree. *The News* believes that replacements will only make back half of the expected 10% drop in new home starts and that oil furnace shipments will slip by 5% to 170,000 units.

As an aside, the Census Bureau reported that 170,134 oil furnaces were shipped in 1988, the latest year for which these data are available. This represents a 6.3% decline from the revised total of 170,134 oil furnaces the Bureau said were shipped in 1987.

Electric furnaces hold their own

The firm hold of electricity as a fuel, particularly in the South, made its presence felt last year as electric furnace shipments more than held their own in the face of a declining new home market.

After a sharp drop in the previous year, electric furnace shipments in 1989 increased by 1.8% to 298,228 units from a 1988 total of 293,095 units, according to GAMA. Last year's total, however, was still far below the 1986



mark of 382,590 units.

The primary role of electric furnaces has been to serve as a backup heat source for air-to-air heat pumps, and as a sole heat source for homes in relatively mild climates. Unlike its gas- and oil-fired cousins, it enjoys only a small replacement market.

Looking ahead, GAMA's members expect electric furnace shipments to forge ahead by 17.5% to 350,600 units this year. Even though home construction in the South appears to have bottomed, weak spots in the South Atlantic region and further multifamily declines prompt us to believe that electric furnace shipments this year will be fortunate to hold even.

For the record, the Bureau of the Census reported that 518,291 electric warm air furnaces were shipped in 1988, the latest year for which these data are available. That represents a 16.3% decline from the 1987 total of 619,102 units. The wide disparity between these and industry figures is accounted for by the fact that the Census Bureau combines electric furnaces and duct heaters in a single category.

All furnaces

Total gas, oil, and electric furnace shipments in 1989 amounted to 2,639,393 units, an increase of 1.9% from the previous year's total of 2,589,045. Last year's total came within a whisker of the 1986 record of 2,687,935 units. It eclipsed the previous record set in 1972, when housing starts were in

their heyday.

The difference between 1972 and now, of course, is the recent strength of the replacement and efficiency upgrade markets. The small gains for gas furnaces and small losses for oil furnaces will contribute to a flat year for combined shipments in 1990. It must be remembered, however, that the plateau is close to record levels.

New home slump hurts boilers

Despite strong replacement and efficiency upgrade markets, a precipitous drop in new home construction in its prime Northeast market was costly in 1989 for the hydronics market.

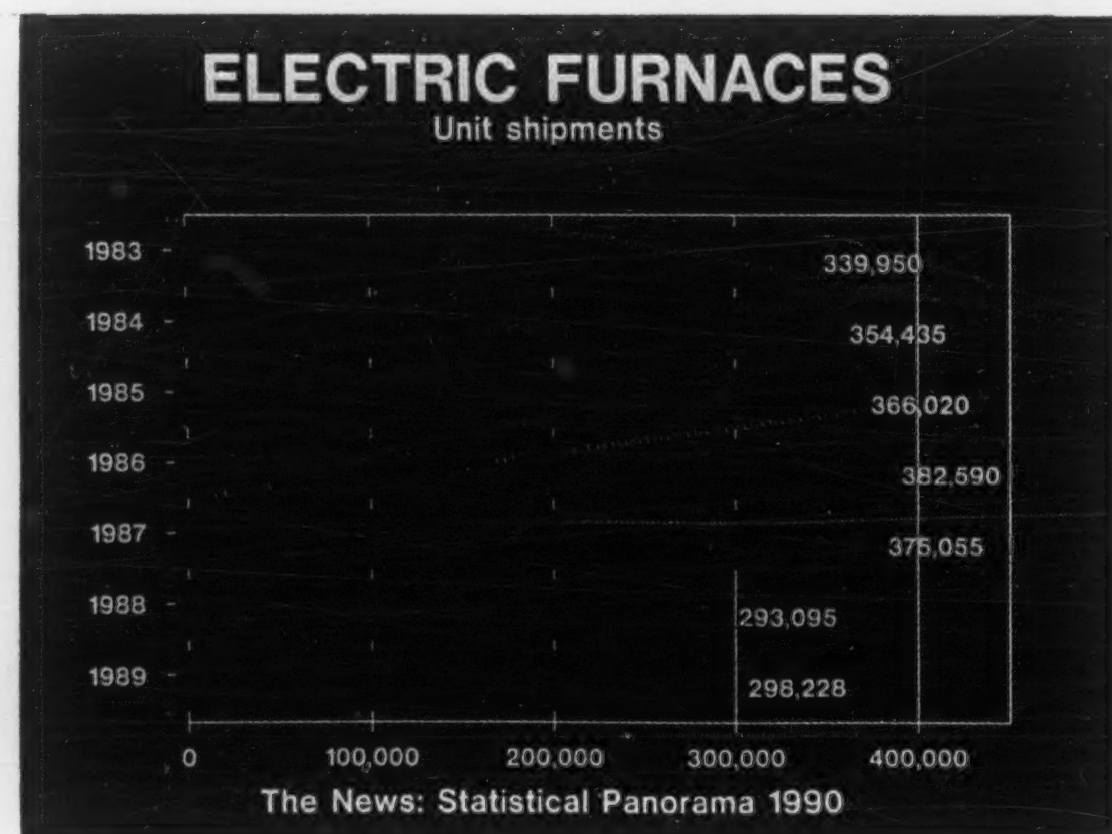
Shipments of cast iron and steel boilers in 1989 totaled 336,406 units, a decline of 8.5% from the 1988 total of 367,440 boilers, according to The Hydronics Institute (HI).

Even so, the drop was only a third of the 24% decline in Northeast new home starts. In the previous two years, boiler shipments managed modest increases in spite of flagging home starts in its prime market area. In fact, it is the first decline since 1983.

Shipments of cast iron boilers, at 303,074 units in 1989, were down 8.1% from the year-previous total of 329,639 units. Shipments of steel boilers, however, were down 11.8% from 37,801 units in 1988 to 33,332 units last year.

Gas-fired cast iron boilers con-

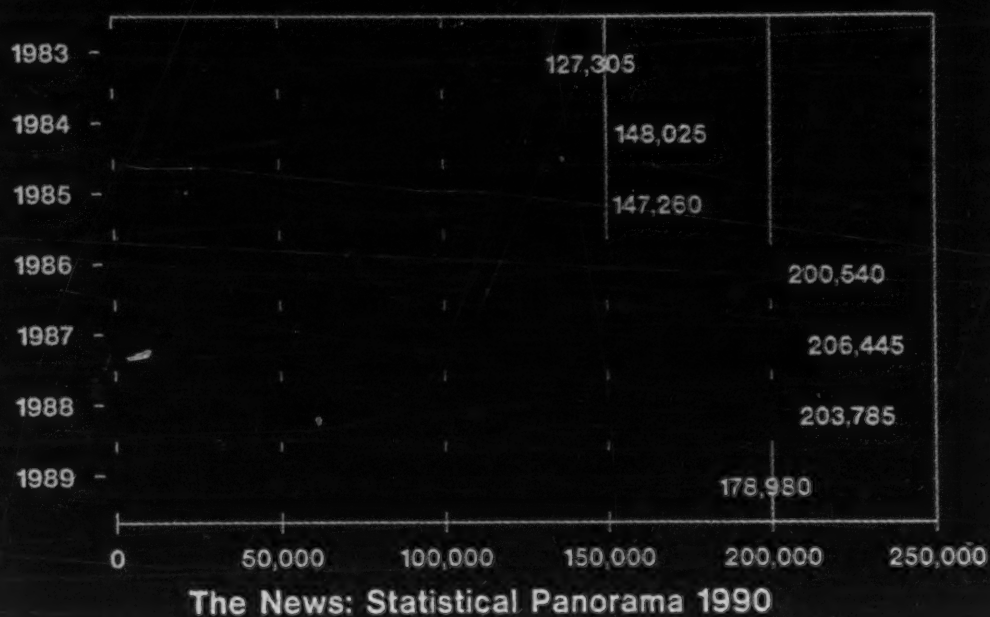
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HEATING

OIL FURNACES

Unit shipments



The News: Statistical Panorama 1990

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(Continued from Page 18)

tinue to dominate the market but it wasn't always so. Gas curtailments in the 1970s restricted the sale of gas boilers. But the sudden availability of natural gas at the turn of the decade, coupled with rapid oil price escalation, led to a surge of demand for gas units. It wasn't until the mid-1980s that historical ratios between oil- and gas-fired units returned to normal.

The gas share of the cast iron boiler market — which peaked at 85% in 1980 from a low of 50% only three years earlier — was 59.8% in 1989, just a bit above the 58.5% share in the previous year. Total shipments of gas-fired cast iron boilers in 1989, at 181,326 units, were down 4.8% from the previous year's total of 192,754 units.

Oil's share of the cast iron boiler market, which peaked at 49.5% in 1977 and dropped to only 15% three years later, was 40.2% in 1989, down from 41.5% a year earlier. Total shipments of oil-fired cast iron boilers in 1989 amounted to 121,748 units, down 11.1% from the year-previous total of 136,885 units.

The share of cast iron hot water boilers, at 81.9% in 1989, was down from the 83% recorded in the previous year. Shipments of hot water units, at 248,359 units in 1989, were 9.3% down from the 273,751 units shipped in 1988. Conversely, steam's share rose from 17% to 18.1% and shipments declined by only 2.1% from 55,888 units in 1988 to 54,715 units last year.

In the case of steel boilers, oil continues to dominate but gas and bare boilers are making marginal gains. Total steel boiler shipments in 1989 amounted to 33,332 units, down 11.1% from the previous

year's total of 37,801 units.

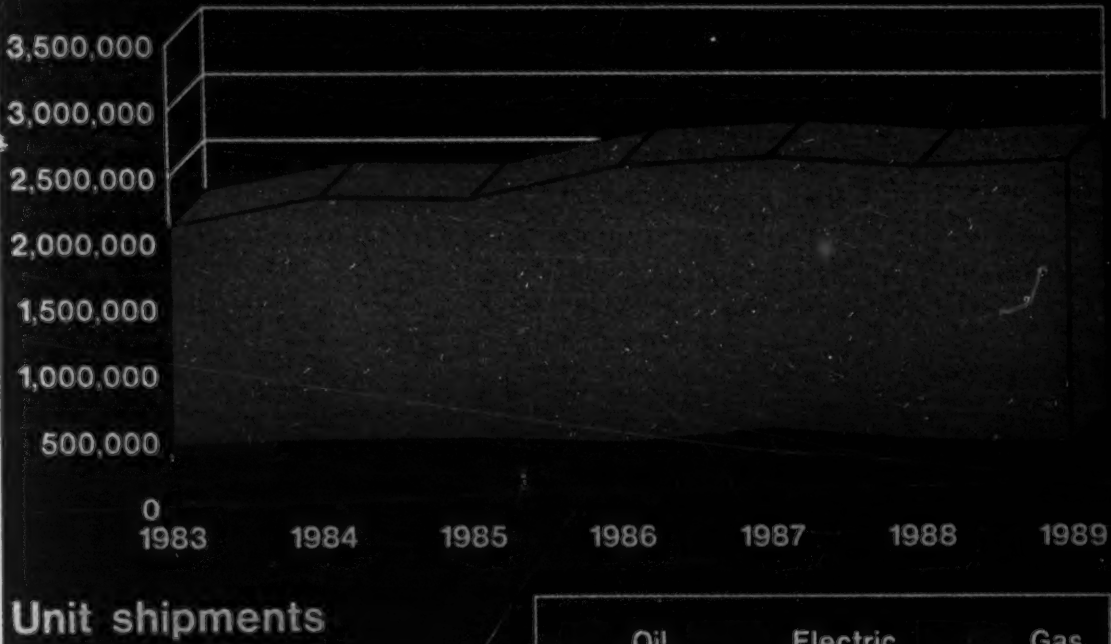
The 29,309 oil-fired steel boilers shipped last year represented a slight loss in market share (from 88.4% in 1988 to 87.9% last year) and a 12.3% loss in shipments from 33,433 units in 1988. Gas-fired units improved market share from 1.9% in 1988 to 2.1% last year but total shipments declined by 3.5% from 723 to 698 units.

The 3,325 bare (without burners) steel boilers shipped last year accounted for the remaining 10% share, up from 9.6% a year earlier. Shipments of bare units also were down 8.8% from the 1988 total of 3,645 units.

Radiation shipments in 1989, according to HI, were:

Convectors — 1,768,225 sq ft EDR (equivalent direct radiation) in 1989, down 2.5% from the 1988 total of 1,813,427 sq ft.

FURNACES (Gas, Oil, Electric)



Unit shipments

The News: Statistical Panorama 1990

Baseboard — 13,365,228 lineal feet last year, down 16.5% from the 1988 total of 16,022,674 ft.

Commercial finned tube — 7,561,843 sq ft EDR in 1989, down 0.3% from the 1988 total of 7,583,456 sq ft EDR.

Finned tube — 1,469,018 lineal feet, up 2.3% from the 1988 total of 1,435,982 ft.

Looking ahead, the hydronics industry can expect that continuing strength in replacements and efficiency upgrades will make up for a further — but less severe — drop in new home starts in its prime markets. We predict that residential boiler shipments will hold even in 1990.

For the record, GAMA reported total gas-fired boiler shipments in 1989 amounted to 191,803 units, down 9.2% from the previous year's total of 211,320 units. Similarly, it reported total oil-fired boiler shipments of 129,975 units last year, down 9.9% from the 1988 total of 144,204 units.

The Bureau of the Census reported that 351,058 cast iron boilers were shipped in 1988, the latest year for which these figures are available. That represents an 8.3% increase over the 324,085 cast iron units the Bureau said were shipped in the previous year.

The Bureau also reported that shipments of gas-fired cast iron boilers in 1988, at 198,560 units, were up 4.2% over the 190,649 units shipped in 1987 and that shipments of boilers fired by oil, coal, and other fuels in 1988 totaled 152,498 units, up 14.3% from the 133,436-unit total for the previous year.

Commercial boilers

The commercial boiler market for 1990 is expected to total 23.6 million pounds of steam per hour (pph), according to the American Boiler Manufacturers Association (ABMA). This represents a 4% decline from the 1989 order rate of 24.5 million pph.

The manufacturer trade association expects burner shipments in 1990 to total 17,228 units, up a hair from the 17,183-unit sales total for last year.

The 1990 forecast for industrial boilers, at 29.7 million pph, is identical with 1989 performance. Similarly, spreader- and overfeed-type stoker orders will help stoker sales in 1990 stay even with the 31-unit total for last year.

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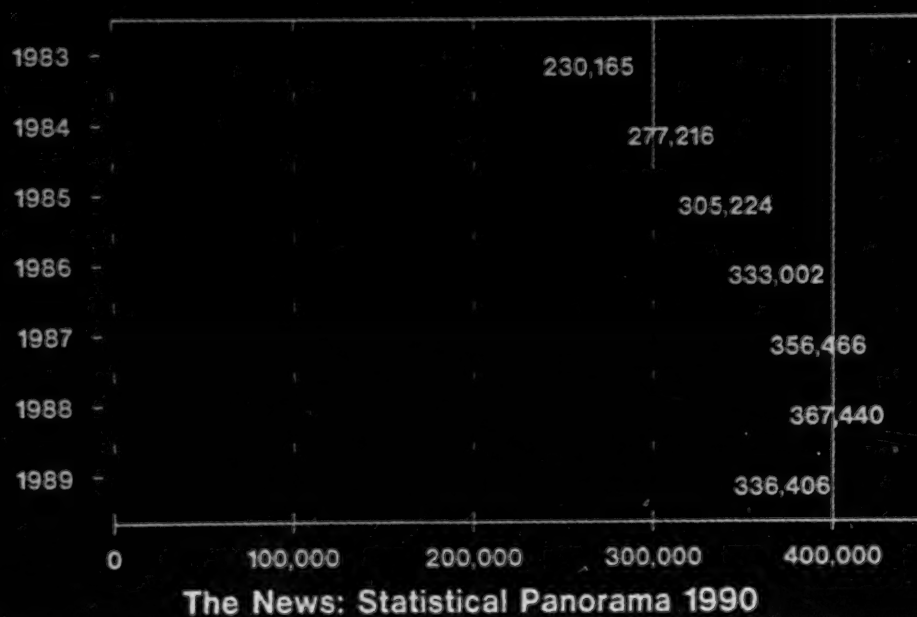
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HEATING

GAS AND OIL BOILERS

Unit shipments



cogeneration market at 589 megawatts in 1989 and expects that number to double this year.

Forecasters projected a combined 2.7-million pph total for purchases of municipal solid-waste units, including both mass-burn and refuse-derived fuel units. That is nearly 93% above the 1989 level of 1.4 million pph.

Pressurized and atmospheric watertube fluid-bed combustion units are forecast to reach 10.9 million pph in 1990, or more than seven times the 1.34-million-pph level of sales recorded in 1989. Atmospheric units remain as the major factor.

For the record, combined domestic and export orders for utility boilers in 1990 to surge to 3,400 megawatts, or double utility boiler performance last year. Export units continue to dominate in both years.

More gas products

Shipments of **gas-fired unit heaters**, at 184,263 units in 1989, were up 8.6% from the year-previous total of 169,605, according to GAMA.

Of the total, shipments of propeller-type unit heaters in 1989, at 173,208 units, were up 8.8% over the previous year's total of 159,129 units. Blower-type unit heater shipments last year, at 11,055 units, were up 5.5% from the 1988 total of 10,476 units.

GAMA's members expect unit heater shipments in 1990 to decline by 3.5% to 177,900 units. We expect the market to at least hold

even this year.

It should be noted that the Bureau of the Census reported that, in 1988 (the latest year for which these data are available), 298,471 gas-fired unit heaters were shipped, a 29% decline from the 420,426 units the Bureau said were shipped in the previous year. The government figures obviously include the production of manufacturers who do not participate in the industry program.

Gas-fired duct heater shipments increased by 12% in 1989 to 20,158 units over the year-previous total of 18,002 units, according to GAMA. The manufacturers expect shipments in 1990 will total 19,000 units.

Gas-fired residential wall furnace shipments in 1989 totaled 175,900 units, up 1.6% from the 1988 total of 173,00 units, according to GAMA. Its members expect shipments in 1990 will hold even.

The category does not include wall furnaces installed in recreational vehicles, but it does include vented wall furnaces, which increased by 0.3% from 107,870 units in 1988 to 108,240 units last year. Direct-vent wall furnace shipments, at 67,660 units in 1989, were up 3.6% from the prior year total of 65,330 units.

The Census Bureau reported that 349,365 wall furnaces were shipped in 1988, up 5.4% from the 1987 total of 331,595 units.

Shipments of **recreational vehicle heating systems** in 1989 were not available from GAMA because of the risk of disclosing in-

dividual manufacturer production numbers. The total for 1988 was 235,518 units.

Shipments of **gas-fired floor furnaces** in 1989, at 18,477 units, were down 9% from the previous year's total of 20,300 units, according to GAMA. The Census Bureau reported that 21,008 gas-fired floor furnaces were shipped in 1988, the latest year for which these data are available. That represents a 6% increase over the 1987 total of 19,808 units.

GAMA reported that a total of 309,972 **gas-fired room heaters** were shipped in 1989, an increase of 5.6% over the 293,587-unit total for the previous year. The manufacturers expect 1990 shipments to equal last year's pace.

Of these, 87,945 were vented room heaters last year, down 3.8% from the 1988 total of 91,426 units. Another 222,027 units in 1989 were unvented room heaters, up 9.8% from the year-previous total of 202,161 units.

More about oil

Oil burner installations in 1989 totaled 555,000 units, an increase of 13% over the previous year's total of 491,000 installations, according to *Fuel Oil/Oil Heat* magazine. The publication reports dealer sales rather than manufacturer shipments.

Of these, 47,000 were installed in new single-family homes, down 11.3% from the 53,000 oil-fired systems installed in new homes in 1988. New home installations totaled 85,000 in 1979.

The new home market in the Northeast, the prime market for oil-fired systems, peaked in 1986. Since that time, successive drops of 8%, 12%, and 24% in new home starts last year have been caused by high prices and a scarcity of improved land. Another drop of at least 10% is expected for this year.

There were 223,000 **replacement oil burners** shipped last year, an increase of 2.3% over the 218,000 replacement burners shipped in 1988.

Unlike other heating systems, there is little or no price differential between old-style burners and the retention-head or other high-efficiency designs. As a result, the magazine reports, virtually all replacements are high-efficiency units.

Fuel Oil/Oil Heat estimates that 185,000 oil furnaces were installed in 1989, down 3.6% from the 192,000 oil furnaces installed in the previous year. Another 147,000 oil-fired boilers were installed last year, down 32.6% from the 218,000 oil boilers installed in 1988.

Conversions to oil from other fuels in 1989 totaled 39,000, according to the magazine, up 18.2% from the 33,000 conversions it reported for 1988. No figures are available for conversions to natural gas, which topped 300,000 in 1980.

The Bureau of the Census reported that 22,069 **separate commercial-industrial oil burner units** were shipped in 1988, the latest year for which these data are available. That represents a 19% increase over the 18,535 commercial-industrial units shipped in 1987. Another 5,895 oil burners were shipped with commercial-industrial boilers in 1988, up 16.7% from the 5,051-unit total for the previous year.

1989 cast iron boiler shipments by thermal capacity

Gross output, Btu/h	Steam	Water	Total
Less than 50,000	621	7,976	8,597
50,000 to 74,999	1,287	22,738	24,025
75,000 to 99,999	8,008	48,035	56,043
100,000 to 124,999	15,335	75,897	91,232
125,000 to 149,999	5,345	20,934	26,279
150,000 to 199,999	10,570	48,107	58,677
200,000 to 249,999	5,496	12,445	17,941
250,000 to 449,999	3,494	7,324	10,818
450,000 to 949,999	2,119	2,697	4,816
950,000 to 1,549,999	1,106	997	2,103
1,550,000 and over	1,334	1,209	2,543
Total	54,715	248,359	303,074

The Bureau reported that, in 1988, a total of 636,678 **residential oil burners and units** were shipped, down 2.6% from the year-previous total of 653,781 units. It reported that 47,840 oil burners were shipped with home furnaces, down 3% from a total of 49,338 units shipped in 1988, and that 55,907 oil burners were shipped with residential boilers in 1988, up 12.4% from the previous year's total of 49,735 units.

Shipments of **oil-fired floor and wall furnaces** in 1988 totaled 5,038 units, according to the Bureau. That represented a 5.8% decline from the 5,346 units shipped in the previous year.

Other heating equipment

Additional perspective on the total comfort space heating market is provided by the Bureau of the Census. It reported that for 1988, the latest year for which these data are available, a total of 942,742 **domestic heating stoves** were shipped, almost the same as the 942,686 total for the previous year.

Of these:

- 161,468 were **gas heating stoves** in 1988, down 27.2% from the 1987 total of 221,867 units. This category includes radiant types as well as vented and unvented circulating types.

- The total for **wood-burning appliances** in 1988, at 449,872 units, was down 1.8% from the year-previous total of 458,221 wood units.

They include 110,599 wood

stoves shipped in 1988, down 1.9% from the 112,747 wood stoves shipped in 1987. The wood stoves include 34,751 circulating types, down 13.6% from 40,228 units shipped in 1987; 38,093 radiant types, down 16.2% from 45,440 units shipped in 1987; and 37,755 of all other types, up 39.4% from 27,079 units shipped in 1987.

Fireplaces include 21,354 free-standing types shipped in 1988, down 15.5% from the 25,260 units shipped in 1987; 271,591 zero-clearance fireplaces shipped in 1988, up 5.4% from the 257,652 units shipped in 1987; and 46,378 fireplace inserts shipped in 1988, down 25.9% from the 62,562 inserts shipped in the previous year.

- **Stoves burning other fuels** such as kerosene, gasoline, fuel oil, and coal shipped in 1988 totaled 331,402 units, up 26.2% from the 1987 total of 262,598 units.

Of the **other electrical heating equipment**:

- 13,756 were nonresidential infrared heaters in 1988, down 55.1% from the prior year's total of 30,653 units.

- 1,734,516 were electric baseboard heating units (except glass panels) in 1988, down 6.5% from the revised total of 1,855,821 baseboard units shipped in 1987.

- 1,564,862 were fixed electric space heaters other than baseboard in 1988, up 2.6% from the 1,525,627 such units shipped in 1987.

- 77,872 were electric unit heaters in 1988, down 72.3% from

(Page 24, Please)

1989 steel boiler shipments

Gross output, MBh	Oil-fired	Gas-fired	Bare	Total
Up to 100	6,348	214	715	7,277
101 to 125	11,662	165	1,142	12,969
126 to 150	6,047	49	853	6,949
151 to 175	3,368	24	512	3,904
176 to 200	709	23	65	797
201 to 300	717	29	19	765
301 to 500	244	29	4	277
501 to 750	113	61	5	179
751 to 1,000	34	38	2	74
1,001 to 1,400	33	12	5	50
1,401 to 2,350	30	52	3	85
2,351 to 3,350	4	2	0	6
Total	29,309	698	3,325	33,332

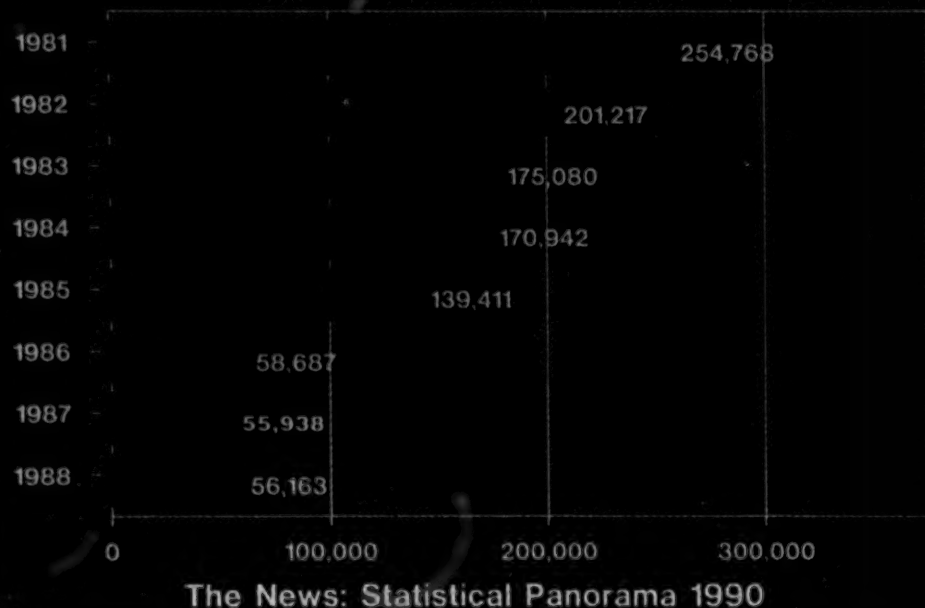
1989 cast iron boiler shipments by fuel

Gross output, Btu/h	Gas-fired	Oil-fired	Total
Less than 50,000	8,588	9	8,597
50,000 to 74,999	23,968	57	24,025
75,000 to 99,999	49,015	7,040	56,055
100,000 to 124,999	45,833	45,403	91,236
125,000 to 149,999	19,149	7,126	26,275
150,000 to 199,999	14,133	44,545	58,678
200,000 to 249,999	10,722	7,220	17,942
250,000 to 449,999	6,484	4,320	10,804
450,000 to 949,999	2,240	2,576	4,816
950,000 to 1,549,999	680	1,423	2,103
1,550,000 and over	514	2,029	2,543
Total	181,326	121,748	303,074

HEATING

SOLAR COLLECTORS

Unit shipments



The News: Statistical Panorama 1990

(Continued from Page 21)

the revised total of 280,595 electric unit heaters shipped in the previous year.

• 3,382,259 were fan-forced electric portable heaters shipped in 1988, up 14.7% from the 2,948,579 units shipped in 1987. Another 550,966 portable electric heaters other than fan-forced were shipped in 1988, up 13.4% from the year-previous total of 485,936 units.

Each Statistical Panorama includes the latest data available. Sources frequently revise their previous year's figures, which explains apparent discrepancies between the latest and earlier published data. Where sources give significantly varying information, that data is mentioned.

Pools get most of solar panels

From its peak in 1980, when 303,102 solar collectors of all types were shipped, the solar collector industry has been in decline. The drop was dramatic after 1985 with the expiration of the 40% residential and 15% business energy tax credits.

According to the Bureau of the Census, shipments of solar collectors in 1988 (the latest year for which these data are available) totaled 56,163 units. This represents a 0.4% increase — the first increase since 1980 — over the 55,938 units shipped in 1987.

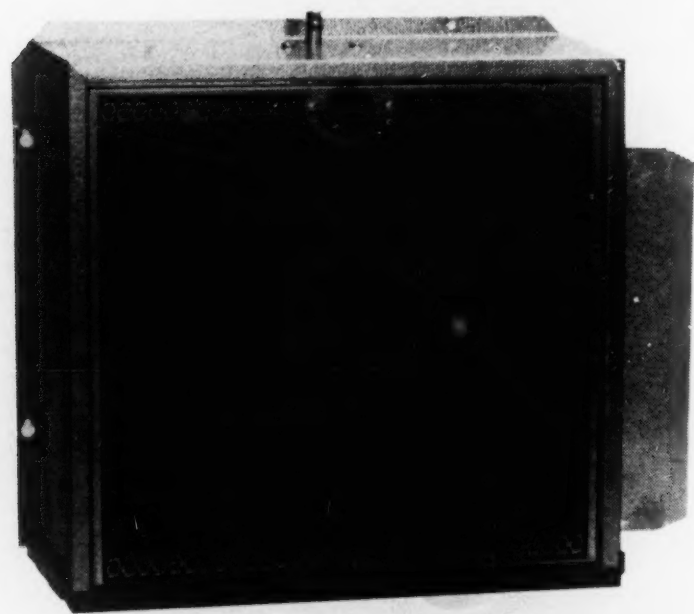
It is still too early to predict a turnaround for this once-subsidized industry. The market still is dominated by low-

temperature collectors mostly used to heat swimming pools. In 1988, this market segment accounted for nearly 93% of the total.

Shipments of low-temperature collectors (below 110°F) totaled 52,134 units in 1988, up 2% from the 1987 total of 51,096 units. Shipments in 1988 of medium-temperature collectors (between 110° and 180°) totaled 4,029 units, down 16.8% from the 1987 total of 4,892 units.

No figures were given for high-temperature, evacuated, or concentrating collectors. Nor was there a breakdown of air and liquid units.

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Circle 32

RELATED PRODUCTS

More merchandising by contractors and a Midwest housing market that is holding relatively firm helped power humidifier shipments maintain a sales level not enjoyed since the 1970s. Existing home sales in the prime areas of the north, with the exception of New England, also helped.

We believe power humidifier shipments in 1989 totaled 572,800 units, an increase of 8% over the previous year's total of 530,400 units.

In years past, industry execu-

tives reported that 90% of power humidifiers were installed in existing homes and that only one in ten went into new residences. They often were installed in new or existing homes for people who, for reasons of health or comfort, felt they wanted the benefits of humidification.

In recent years, however, a growing number of merchandising contractors are quoting on power humidifiers along with furnace or air conditioning replacements. This factor, coupled with the trend

toward larger trade-up homes, has helped humidifiers maintain an upward shipment spiral at a time when existing home sales are stagnating and new home starts have declined for three years in a row.

These facts were underlined in a contractor survey conducted by *The News* last year. Two-thirds of the respondents said they always try to sell a power humidifier with a new furnace. Of those surveyed, more than a quarter said they installed from 10 to 20 humidifiers in the previous year and another quarter said they installed from 20 to 40 units.

Of those installed, an average of 18.7% went into new homes, 29.4% were first installations in existing homes, 34.7% were sold with replacement furnaces, and 17.2% replaced existing humidifiers. And, although half said the sale of power humidifiers through retail outlets hurt their business, three-quarters denied that the sale of portable units through retailers hurt them.

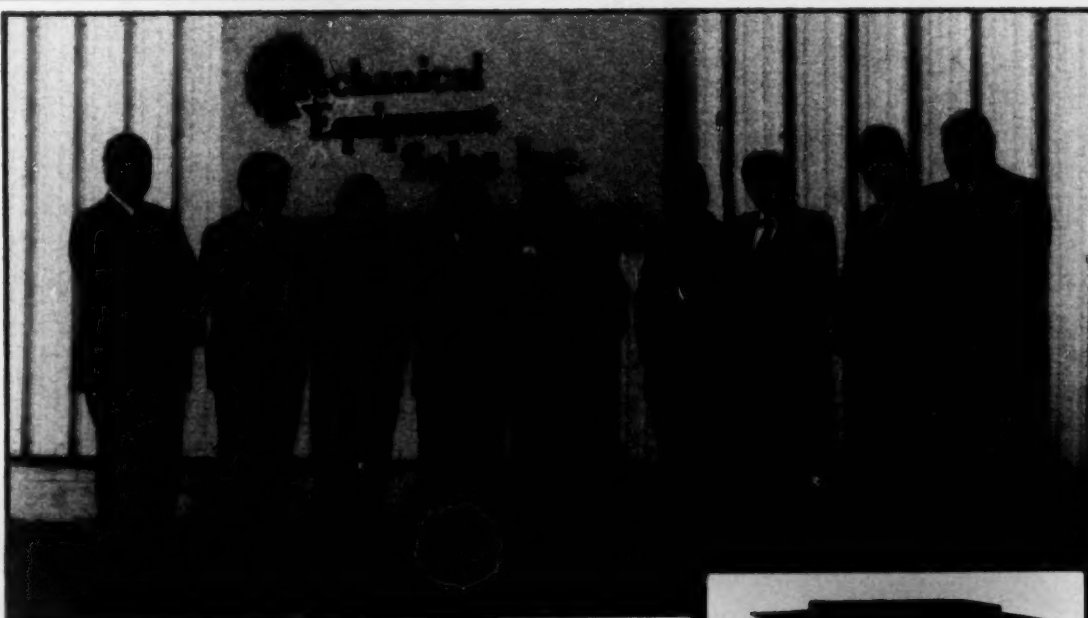
A fear that the power humidifier market would be limited by the growing number of tightly insulated homes has not materialized. Few super-insulated homes, which require ventilators or dehumidifiers to reduce the humidity levels produced by household activities, are being built. The remaining 100 million homes provide solid market potential.

Manufacturers have been influenced, however, to produce units with smaller capacities for condominiums, town houses, and generally higher insulation values. Special units also have been developed for use with heat pumps.

For the record, the Bureau of the Census reported that 493,897 power humidifiers were shipped in 1988, the latest year for which these data are available. That represents an 8.7% increase over the prior-year total of 454,294 units.

Fans

Preliminary figures indicate that, again in 1989, all four North American categories reported by the Air Movement and Control Association (Page 26, Please)



10,000 Cost Cutters

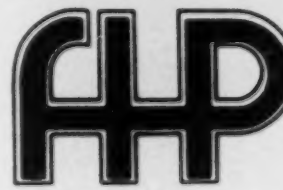
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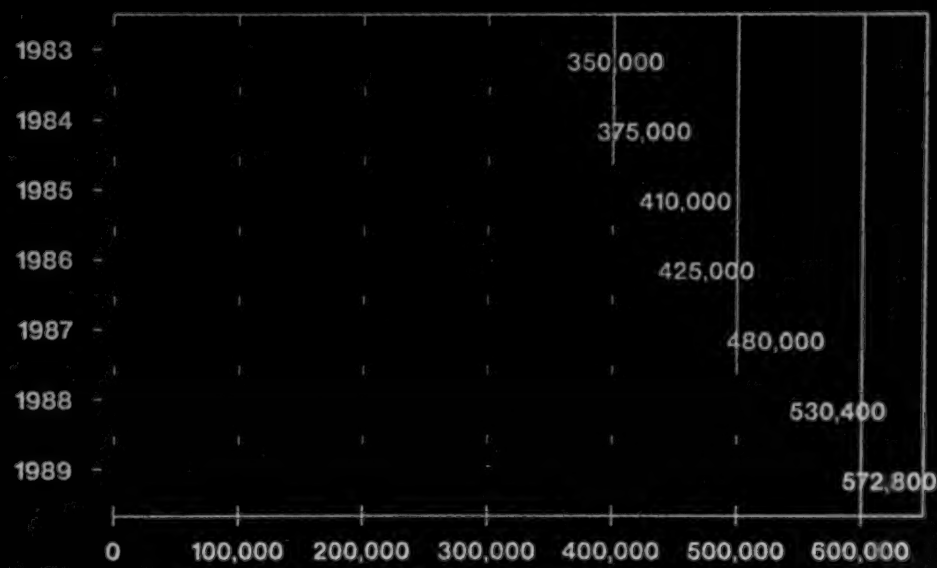
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Circle 10

RELATED PRODUCTS

POWER HUMIDIFIERS

Unit shipments



The News: Statistical Panorama 1990

(Continued from Page 24)

sociation (AMCA) demonstrated substantial increases.

Shipments of centrifugal fans last year totaled \$202,600,000, an increase of 16.9% from the 1988 total of \$173,278,891.

Industrial axial and propeller fan shipments in 1989, at \$84,700,000, were 12% above the previous year's total of \$75,594,148.

The total value of power roof ventilator shipments last year was a record \$112,400,000, a 12% increase over the previous record set in 1988 of \$100,409,797.

In the Air Control Division, shipments of louvers, dampers, and shutters last year totaled \$97,800,000, an increase of 8.3% over the previous year's total of \$90,303,953.

The total for the four product categories in 1989 was \$497,500,000, an increase of 13.2% over the previous year's total of \$439,600,000. AMCA reported that total Canadian shipments in 1989 amounted to \$71,100,000.

The North American shipment figures do not include the value of shipments made to the power generation market, which were shifted to another category not made public.

Central station air handlers

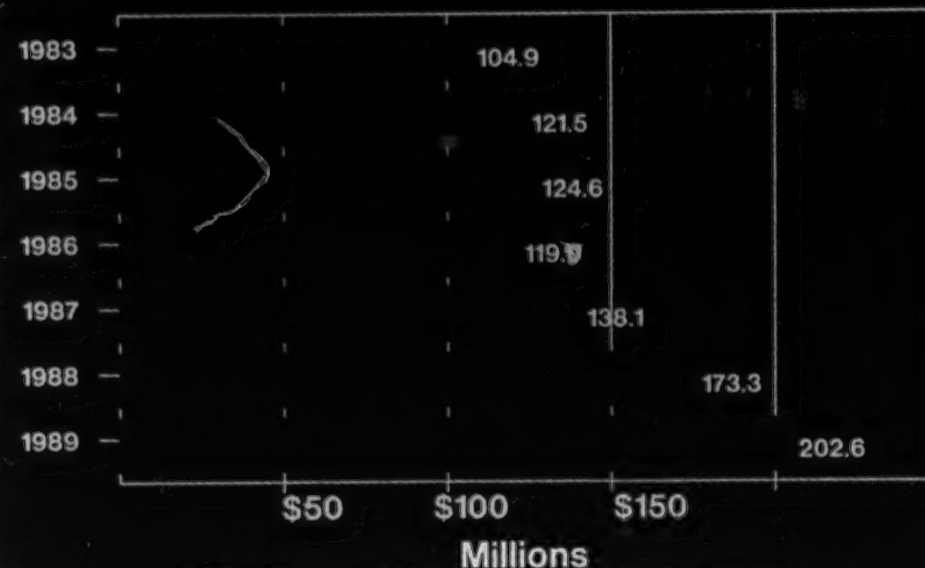
Shipments of central station air handlers last year totaled 49,500 units, an increase of 3% over the 1988 total of 48,100 units.

For the record, the Bureau of the Census reported that 70,353 central station air handlers were shipped in 1988, the latest year for which these data are available. That represents an 18.5% increase over the 59,359 central station air handlers the Bureau said were shipped in 1987.

Of those central station air handlers the Bureau said were shipped in 1988, draw-through units made up 79.8% of the total, 12.4% were blow-through units, and 7.7% were heating and ventilating types.

CENTRIFUGAL FANS

Millions of dollars



The News: Statistical Panorama 1990

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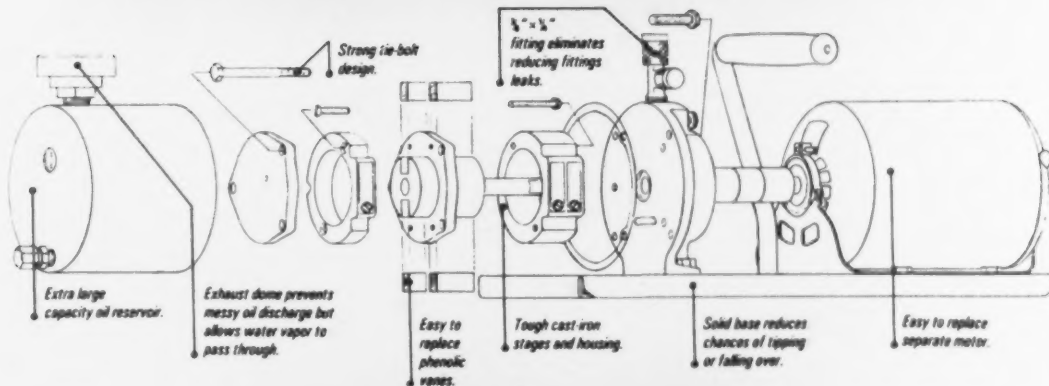
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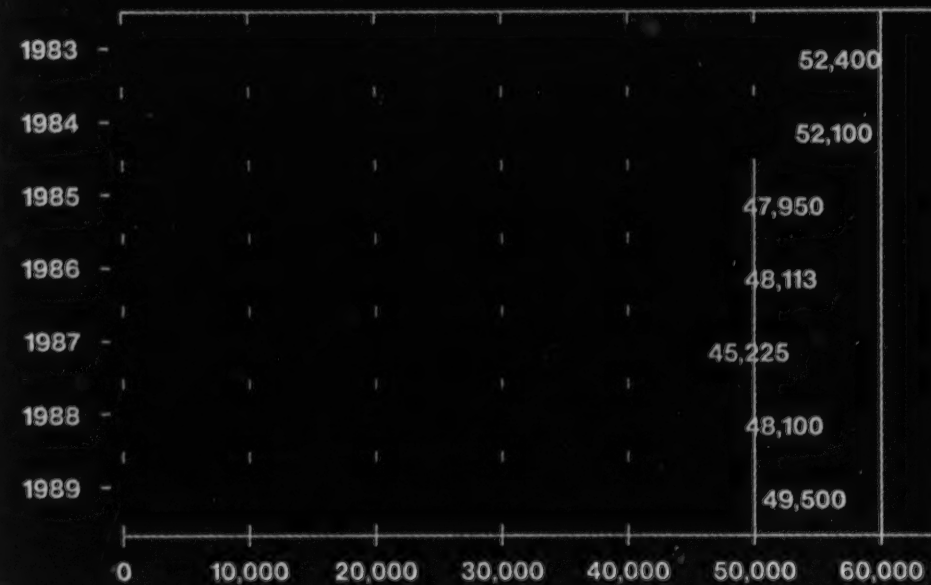
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Circle 37

CENTRAL STATION AIR HANDLERS

Unit shipments



The News: Statistical Panorama 1990

Electronic air cleaners

Helped by strong comfort heating and cooling replacement sales and the growing number of merchandising contractors, electronic air cleaner (eac) shipments edged upward again in 1989.

According to our estimates, shipments of electronic air cleaners in 1989 totaled 200,300 units. That represents a 3.5% increase over the previous year's total of 193,500 units.

Eacs have a special compatibility with heat pumps because of their ability to keep the indoor coil clean in winter when there is no condensate to help remove airborne dust. They are also helpful in removing the short-lived radon

daughters that characteristically attach themselves to airborne dust. Eacs cannot, however, remove radon gas.

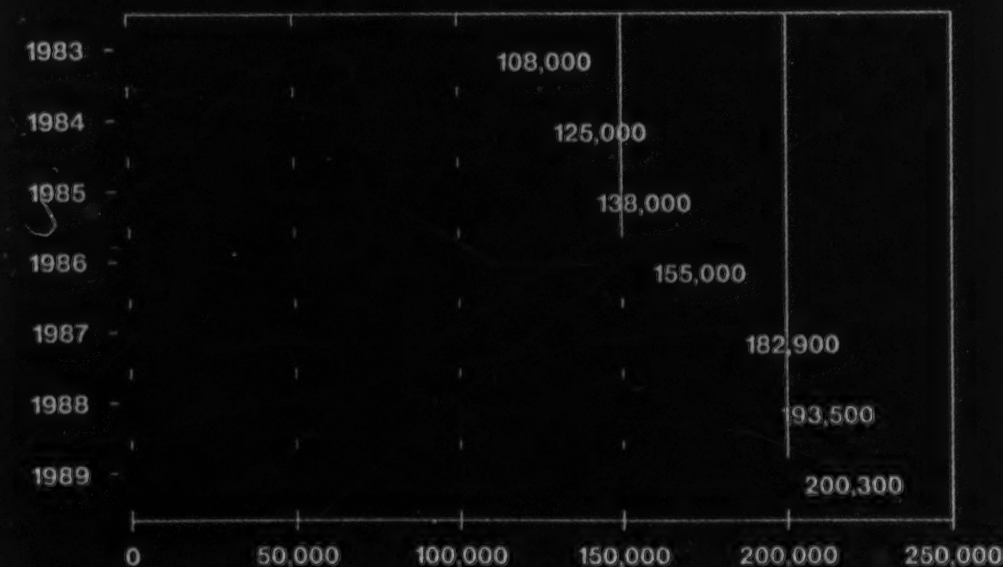
Still over the horizon is another market which, we think, will develop in the early 1990s. It's based on the increased consciousness of indoor air quality and the ability of eacs to remove pollen and other airborne particulates.

A major eac producer, Honeywell, believes eacs represent a \$500 million untapped market for contractors. Judging the saturation of eacs at only 5% of U.S. homes, the company has launched a five-year program to include an eac with every fourth furnace, central air conditioner, or heat pump

(Page 28, Please)

ELECTRONIC AIR CLEANERS

Unit shipments

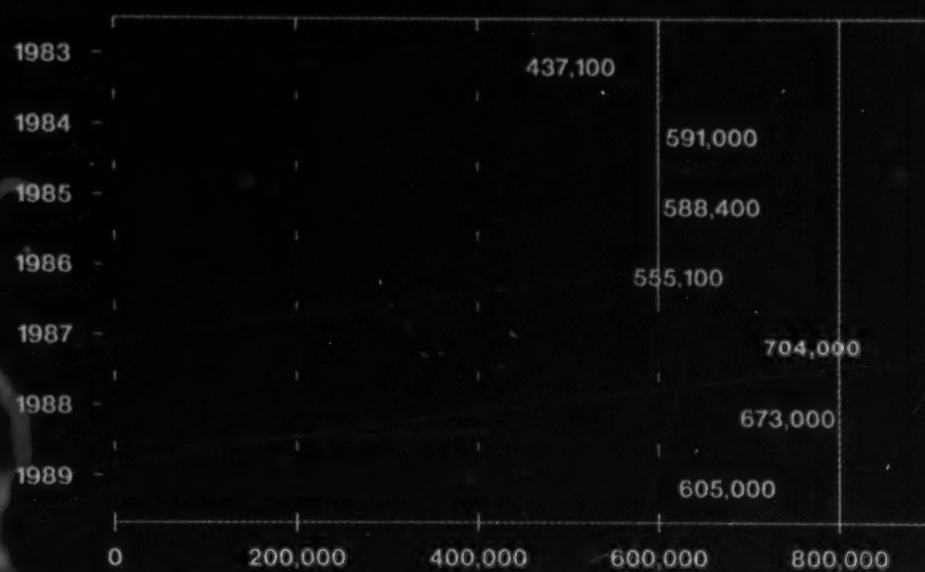


The News: Statistical Panorama 1990

RELATED PRODUCTS

DEHUMIDIFIERS

Unit shipments



The News: Statistical Panorama 1990

(Continued from Page 26)

installed.

That would mean shipments of more than one million each a year. Already, many merchandising contractors include quotes for each and power humidifiers with each bid in order to build profit and instill a quality image in the mind of the homeowner.

Dehumidifiers

Shipments of dehumidifiers totaled 605,000 units last year, a 10.1% decrease from the total of 673,000 dehumidifiers shipped in 1988, according to the Association of Home Appliance Manufacturers (AHAM).

Looking ahead, AHAM's members expect shipments this year to improve slightly to 610,000 units and, in 1991, to show a larger increase to 651,000 units. The industry shipped 704,000 dehumidifiers in 1987.

For the record, the Bureau of the Census reported that 454,208 dehumidifiers were shipped in 1987, the latest year for which these data are available. No totals were reported for 1988 because of disclosure fears.

Refrigerants

U.S. shipments of the three most common refrigerants — CFC-11, CFC-12, and HCFC-22 — totaled 911,986,000 pounds in 1989, a decrease from the previous year's total of 931,404,000 pounds.

Shipments of CFC-11 last year totaled 193,249,000 pounds, a decline of 13.4% from the 1988 total of 223,196,000 pounds.

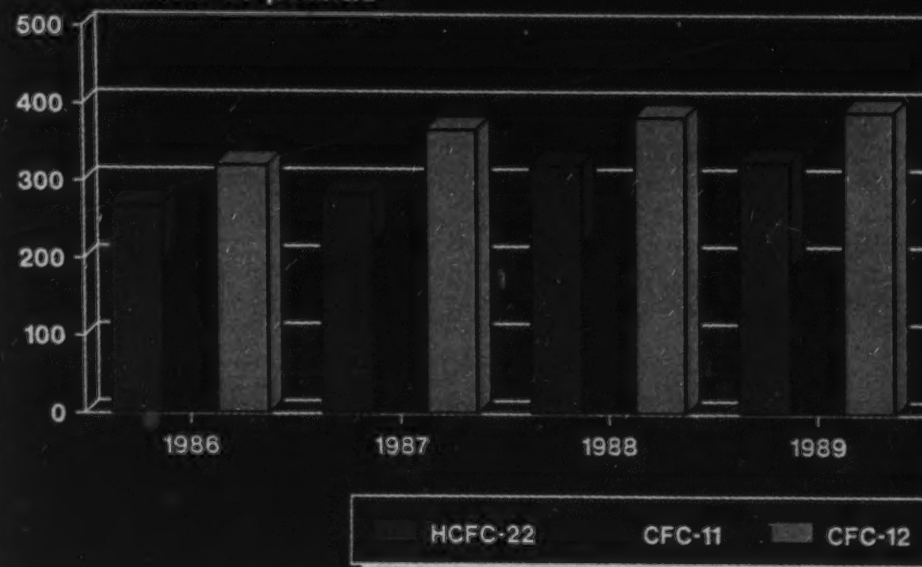
Shipments of CFC-12 in 1989 totaled 391,546,000 pounds, an increase of 1.8% from the year-previous total of 384,484,000 pounds.

Shipments of HCFC-22, so designated because it is hydrogenated and mostly breaks down in the lower atmosphere, totaled 327,191,000 pounds in 1989, an increase of only 1% from the 1988 total of 323,723,000 pounds.

That's only part of a story that

REFRIGERANTS

Millions of pounds



The News: Statistical Panorama 1990

develops a new chapter almost daily.

In line with the 1987 Montreal Protocol signed by more than 70 nations, the Environmental Protection Agency froze U.S. production of CFCs -11, -12, -113, -114, and -115 at 1986 levels on July 1 of last year. A 20% reduction from 1986 levels, based on the ozone depletion factor of the chemicals, is scheduled for 1993 and a 50% reduction is slated for 1998.

The freeze, which had the immediate effect of cutting production of CFC-11 by 9.5% and CFC-12 by 16.2%, already has put users and the distribution chain on allocation. A session of the United Nations Environmental Program, which administers the protocol, will be held this summer. It's likely to speed up cutbacks on production and eliminate the manufacture of the chemicals by the end of the century.

In a move that had little to do with speeding up the elimination of CFCs, Congress imposed a tax of \$1.37 a pound (based on ozone depletion factor) on Jan. 1 this year. The tax will escalate to \$1.67 in 1992, \$2.65 in 1993, \$3.10 in 1995, and another 45 cents per pound each year thereafter.

Not included in the tax scheme is the refrigerant reclaimed from existing systems. Quality standards have been established by the Air-Conditioning and Refrigeration Institute (ARI), the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), and the Society of Automotive Engineers (SAE) but, to date, the reclaim infrastructure is scanty.

An important factor little discussed in public forums is the question of whether, and under what circumstances, manufacturers will continue to honor warranties if their equipment is charged with reclaimed refrigerant. So far, at least, tests detailed enough to certify new-refrigerant quality cost \$200 and up per test.

Meanwhile, a debate has sprung up among environmentally motivated legislators in a majority of states that HCFC-22, which has an ozone depletion factor of only 0.5 compared to one for CFC-11 and CFC-12, should also be banned. One of the alternatives currently being tested, HCFC-123, supposedly would be added to this list.

Another factor growing in importance is the debate over possible global warming. Some scientists claim that fluorocarbon compounds are responsible for as much as 15% of the global warming potential imposed by trace gases.

As the debate in Congress and in state legislatures continues, the industry awaits the approval and ultimate production of substitute refrigerants. Although thermodynamic substitutes have been identified for most uses, toxic and mutagenic testing is not complete nor is lubricant and materials compatibility development.

The industry, meanwhile, has remained relatively calm. Supermarkets are converting from R-502 and CFC-12 to HCFC-22, chiller manufacturers claim to have new designs ready for the alternate refrigerants, and auto manufacturers promise air conditioners charged with HFC-134a by the 1993 model year.

Most affected by the freeze and cutbacks are commercial air conditioning chillers, commercial refrigeration systems, mobile air conditioning and refrigeration systems, drinking water coolers, ice makers, and home refrigerators and freezers.

Because activity on all fronts is so volatile, it is best followed in the weekly issues of *The News*.



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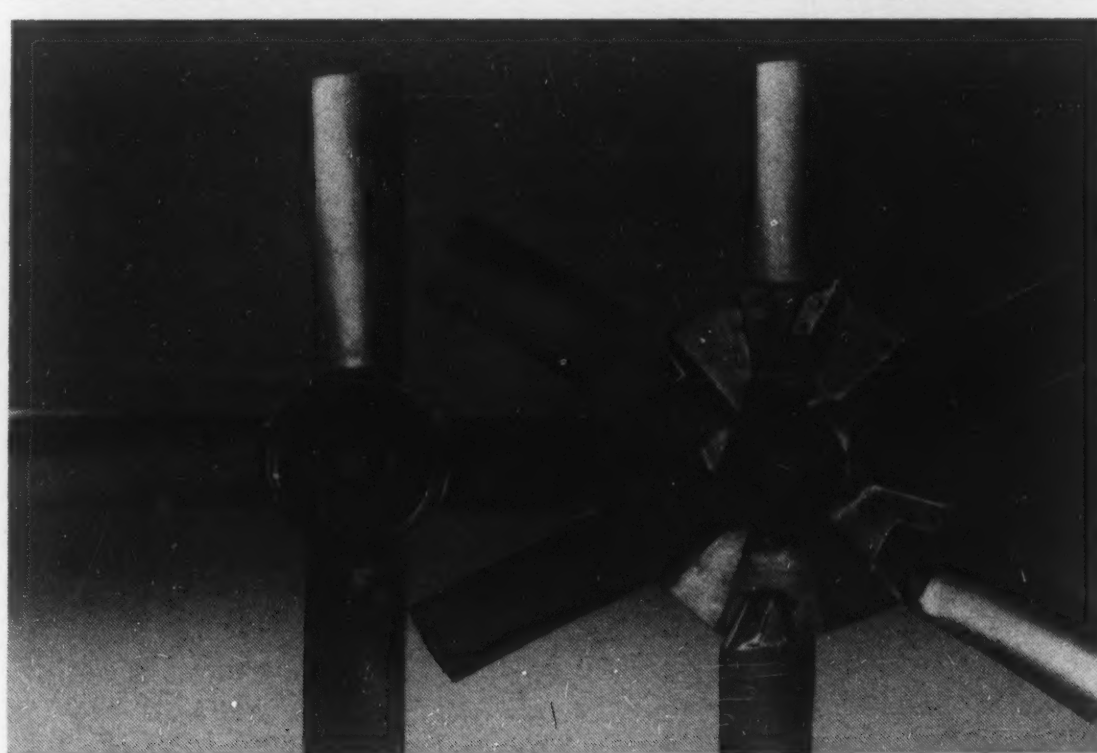
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Circle 2

COMFORT AND CONSTRUCTION

Against a backdrop of markets dominated by price and static design initiatives, comfort heating and cooling systems over the past few years have demonstrated increased emphasis on technological innovation by manufacturers and a growing appetite among owners for higher efficiencies — but not at the expense of comfort.

It's a change that has dramatically altered both equipment design and the way it is marketed by manufacturers and contractors. Both have discovered that a significant number are willing to pay a premium first cost in order to ensure energy — and dollar — savings in future years.

Moderating fuel price escalations, or even small reductions, over the past four years have had only a slight dampening effect on this reach for higher efficiencies and lower fuel bills. The trend already has produced volume markets for the equipment needed to meet the mandatory federal minimum efficiencies for central residential comfort systems starting in 1992.

In fact, a substantial new market — replacing inefficient equipment in good working order — has developed over the past five years.

This market, helped in part by utility efficiency incentives, promises to become even stronger in 1992 and beyond with the elimination of low-efficiency equipment and escalating fuel prices.

Back in the 1970s, the efficiency of an air conditioner, a heat pump, a furnace, or a boiler was mostly an academic consideration. The few who made or marketed equipment markedly more efficient than that of competitors could find few who appreciated the difference enough to pay the premium cost. Price was supreme and equipment was considered almost a commodity.

But those attitudes among both buyers and sellers have changed.

Instead of the atmospheric gas furnace with standing pilot that dominated the market in the 1970s, there are three higher efficiency ranges that use electronic ignition, power burners, micro-electronic controls, condensing heat exchangers, and new combustion technology to achieve seasonal efficiencies as high as 96%. Nearly one-third of shipments last year were in the highest two of these categories.

Air conditioners that once competed on the price-induced basis of

how little coil surface was needed for a given capacity now use microelectronics, vastly improved compressor and heat exchanger components, and variable-speed drives to achieve efficiencies thought impossible only a decade ago.

Heat pumps, once accepted as necessarily poorer cooling performers than air conditioners because of coil compromises, today have edged out cooling-only units in the efficiency race. Some ductless units feature infrared wireless controls that enable users to fine-tune comfort levels and change airflow direction from anywhere in the room.

In the case of rooftops and large commercial equipment, advances in compressors and in combustion have been supplemented by more widespread use of microprocessors and variable-speed drives. Two major manufacturers now mount microprocessors on both packaged equipment and field-engineered system components so they can be linked to a sophisticated ddc (direct digital control) central system.

Large control systems, once anchored to a custom computer, now use PCs routinely; components

can operate on their own should the central control system be disrupted. Overlay communication networks and plug-in modular control modules allow both pneumatic and electronic control components to work in harmony in the same building. And, in the wings is a protocol that will allow both new and old systems of different manufacture to be combined.

But, apart from the increased use of microprocessors that allow changes to be made with software instead of redesigning components, is the growing emphasis on comfort. These systems, which grew out of a need for energy management, now are being used as much to ensure comfort throughout the building as they are to save on energy usage.

And the best is yet to come.

The advent of federal minimum efficiencies for residential heating and cooling equipment in 1992 will set the stage for widespread technological improvements. Central air conditioners and heat pumps will have to meet an SEER (seasonal energy efficiency ratio) of at least 10, and heating equipment will have a floor of 78% AFUE (annual fuel utilization efficiency).

There is no doubt that the industry will be able to meet both minimums. Importantly, there will be room for competition above those floor values. Today's market, for example, offers SEERs above 17 and AFUEs in the mid-90s. We expect to see more high-efficiency innovation in late 1991 as the 1992 units are introduced to distributors and contractors.

We can look forward to more extensive use of inverter drives, microelectronics, scroll, screw, and dual rotary compressors, enhanced heat exchangers and combustion techniques, and more integration of comfort and domestic hot water systems.

Contractor marketing

The world of the contractor also is changing dramatically. Not only must they find the time to train installation and service technicians to handle the new technologies, but the once-thin ranks of merchandising contractors are beginning to swell.

Contractor marketing is taking on a new dimension. Instead of waiting for the telephone to ring, an increasing number of contractors are developing marketing

(Page 33, Please)

Space heating fuel										
Gas	583,000 52%	87,000 44%	166,000 83%	154,000 33%	176,000 68%	587,000 54%	85,000 45%	162,000 84%	164,000 36%	176,000 71%
Electricity	445,000 40%	52,000 27%	26,000 13%	303,000 65%	64,000 25%	402,000 37%	43,000 23%	22,000 12%	282,000 62%	53,000 22%
Oil	58,000 5%	52,000 27%	3,000 1%	— —	— —	60,000 6%	57,000 30%	— —	3,000 1%	— —
Other/none	38,000 3%	5,000 2%	6,000 3%	8,000 2%	19,000 7%	36,000 3%	3,000 1%	6,000 3%	8,000 2%	18,000 7%
Heating system type										
Central heating	1,022,000 91%	169,000 86%	191,000 95%	437,000 94%	224,000 87%	1,003,000 92%	170,000 91%	184,000 96%	431,000 94%	218,000 88%
Warm air ducted	943,000 84%	98,000 50%	187,000 93%	436,000 93%	222,000 86%	928,000 86%	105,000 56%	179,000 94%	429,000 94%	215,000 86%
Warm air furnace	640,000 57%	70,000 36%	175,000 87%	212,000 45%	184,000 71%	648,000 60%	80,000 43%	168,000 88%	215,000 47%	185,000 74%
Heat pump	303,000 27%	28,000 14%	13,000 6%	224,000 48%	38,000 15%	280,000 26%	25,000 13%	11,000 6%	214,000 47%	30,000 12%
Hydronic	78,000 7%	71,000 36%	4,000 2%	— —	— —	75,000 7%	65,000 35%	5,000 2%	— —	3,000 1%
Built-in electric	57,000 5%	23,000 12%	7,000 4%	15,000 3%	12,000 5%	43,000 4%	16,000 8%	5,000 2%	13,000 3%	10,000 4%
Other built-in	44,000 4%	4,000 2%	3,000 2%	15,000 3%	22,000 9%	38,000 3%	— —	3,000 1%	13,000 3%	20,000 8%
With central air conditioning	801,000 71%	93,000 48%	134,000 67%	432,000 92%	141,000 55%	810,000 75%	97,000 52%	136,000 71%	428,000 94%	148,000 60%
Space heating fuel										
Gas	223,000 41%	36,000 59%	62,000 62%	29,000 15%	95,000 50%	196,000 44%	40,000 64%	56,000 63%	20,000 14%	80,000 52%
Electricity	307,000 56%	18,000 30%	37,000 37%	162,000 84%	89,000 47%	238,000 54%	18,000 29%	32,000 36%	118,000 85%	70,000 45%
Oil	5,000 1%	5,000 8%	— —	— —	— —	4,000 1%	3,000 6%	— —	— —	— —
Other/none	12,000 2%	2,000 3%	— —	2,000 1%	6,000 3%	7,000 2%	1,000 1%	1,000 1%	— —	— —
Heat pump	148,000 27%	10,000 16%	9,000 9%	85,000 44%	45,000 24%	118,000 26%	10,000 15%	11,000 12%	66,000 48%	32,000 20%
With air conditioning	471,000 84%	51,000 82%	95,000 94%	191,000 99%	134,000 71%	375,000 84%	55,000 88%	85,000 96%	137,000 99%	99,000 63%
Mobile home placements										
	239,000	24,000 10%	40,000 17%	145,000 61%	30,000 12%	224,000	23,000 10%	39,000 17%	131,000 59%	32,000 14%
With central air conditioning	116,000 49%	3,000 14%	15,000 38%	88,000 60%	10,000 34%	108,000 48%	4,000 18%	16,000 40%	78,000 80%	10,000 33%

SOURCE: Census Bureau. All numbers are rounded. Built-in "electric" includes electric baseboard, panel, or radiant heat. Built-in "other" includes room or space heaters, floor or wall furnaces, solar, and other types of heating.

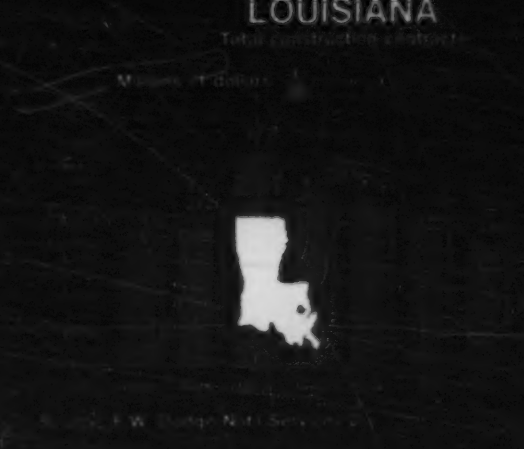
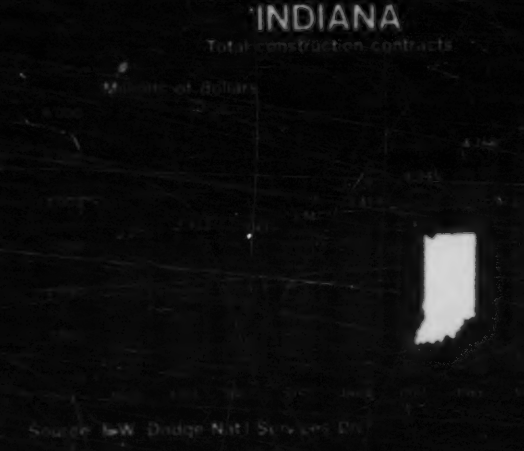
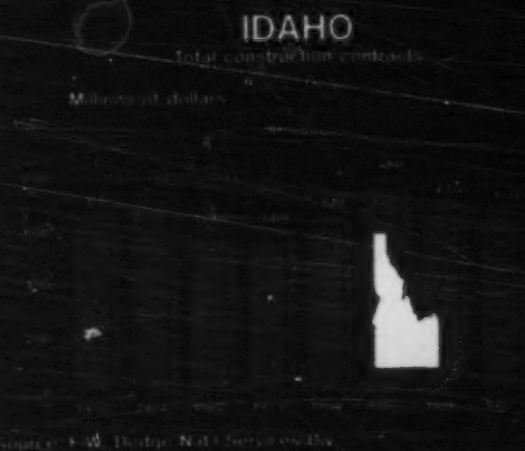
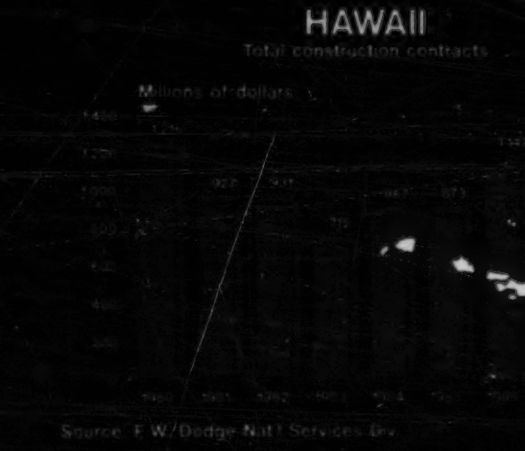
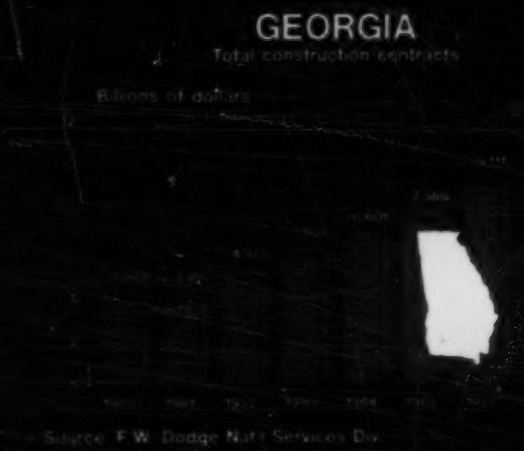
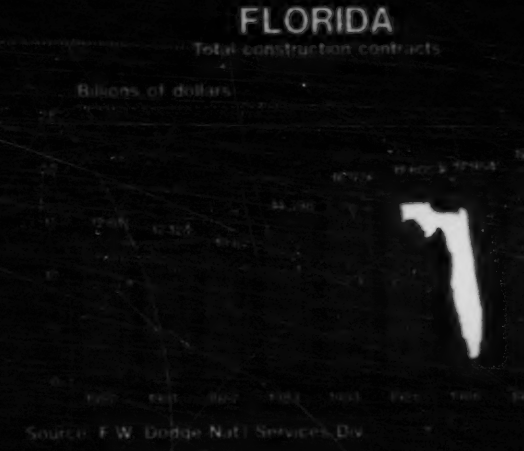
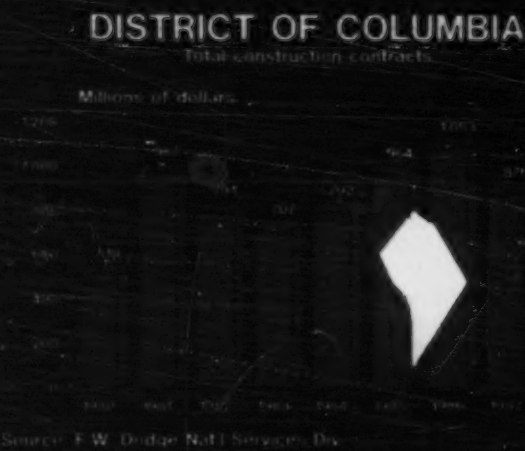
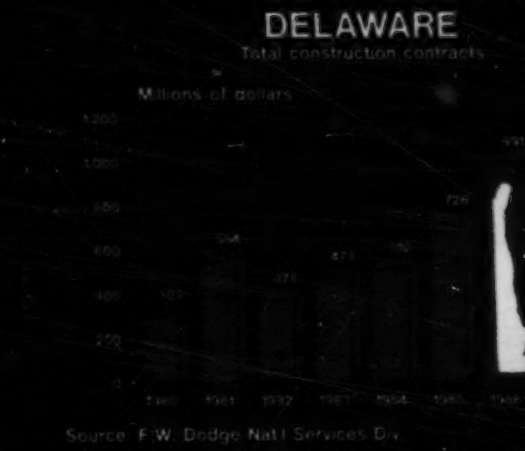
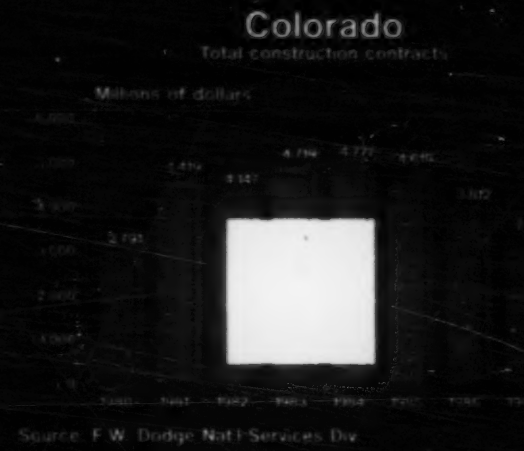
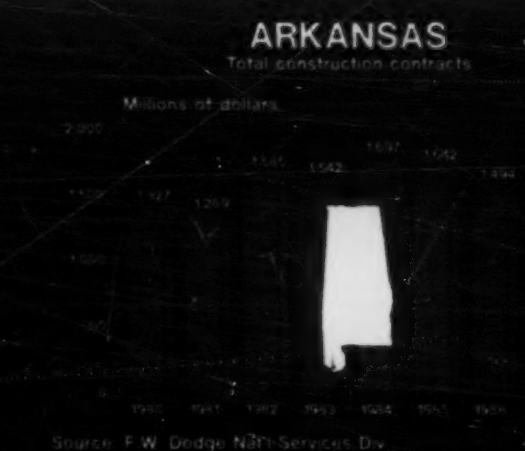
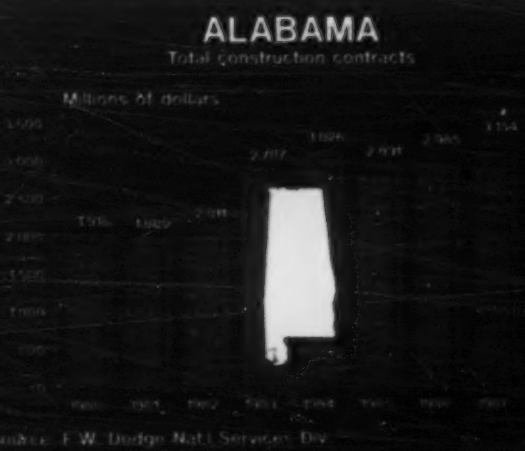
Here are the 50 states — and how they grew in the 80s

Here we present in graphic form the residential and nonresidential building patterns, for the 50 states for the period 1980-88. Numbers represent the value of construction contracts in millions of dollars, and include nonbuilding contracts. (Typically, nonbuilding represents

about 18% of all contracts.) This will provide a "big picture" view of construction activity during the 1980s. Some key states, like California, show a saw-toothed pattern of construction, but with a generally upward direction. Others, like Texas and Oklahoma, show a bell-

shaped curve, reflecting the oil recession. On page 40 are graphics showing the national trends for nonresidential construction during 1980-88, expressed in millions of square feet. Within this general category are presented such sub-categories as com-

mercial, manufacturing, education, hospital, public building, religious, and social-recreational. All data are from the F.W. Dodge Division of McGraw-Hill Information Systems Company, as contained in the *Statistical Abstracts of the United States*.



COMFORT AND CONSTRUCTION

(Continued from Page 29)

plans aimed at flushing out residential and commercial owners who can be sold on upgrading inefficient equipment.

We believe that these contractors, many of whom are being assisted materially by manufacturer principals, will dominate local markets within a few years. No longer will service be the overwhelming source of replacement sales.

Already there is evidence that a fewer number of contractors in a given community will handle a larger share of the business. And, for those with marketing plans, that larger share holds the promise of more profitable sales as well.

But how far and how fast this new breed of contractor will develop is bound to be limited by the availability of trained technicians. One assist on the near horizon is the adoption of on-board diagnostics that will help technicians troubleshoot a system without the need of buying special diagnostic equipment.

A quick history

In the years immediately following the OPEC oil embargo of 1973, the avoidance of high fuel bills took the form of added insulation, weatherization, the elimination of pilots on gas-fired equipment, more coil surface on air conditioners and heat pumps, and an interest in solar, wood, and other renewable resources.

The adoption of new technology, coupled with a consumer willingness to pay a premium for increased efficiency, had its beginnings in 1979 but did not fully develop until 1984. No longer were furnaces considered as extensions to the ductwork, nor was there competition to see how little coil surface was needed for a given capacity.

Today, the education of both the consumer and the government is well-advanced. In a 1988 survey conducted by the National Association of Home Builders, for example, 69% of those who had purchased homes since 1980 listed energy features as a "very important" factor in their home-buying decision.

There are also a few clouds. The industry's technical society was slow to update the energy standards that are used as a basis for a wide range of state and local codes. And moderating fuel price increases, particularly gas and

fuel oil, have slowed the move toward high-efficiency heating equipment. Air conditioners and heat pump efficiencies continue to increase, due partly to continued utility rebates.

The restricted availability of CFC refrigerants, which became effective in mid-1989, will have a mixed effect on the indoor comfort industry. Unaffected to date are central residential air conditioners and heat pumps, as well as commercial packaged units, that use HCFC-22. However, even this refrigerant today is coming under attack.

Affected most will be the installed centrifugal and other chillers that use either CFC-11 or, in much fewer instances, CFC-12. Not only do they face a new tax (\$1.37/lb as of Jan. 1 and graduating upward each year after 1990), but production likely will be phased out completely by the end of this decade.

Chiller manufacturers report they have developed equipment that can use the expected replacements (HCFC-123 for CFC-11 and HFC-134a for CFC-12), but it will be two years or more before these replacement candidates have completed safety tests and are available in commercial quantities.

That means that today, and in the foreseeable future, reclaiming and recycling of CFCs will take on critical dimensions. Reclaimed CFCs also are not subject to the federal tax.

Heating

In the days of cheap and abundant natural gas, there was little incentive to install anything but an inherently reliable and inexpensive atmospheric furnace or boiler with a standing pilot. The natural venting arrangement meant that conditioned air was lost up the flue whether the unit was operating or not. The pilot often burned all summer to keep dampness from the simple clamshell heat exchanger.

These units had a steady-state efficiency of at least 80% but, on a seasonal basis, they were hard pressed to top 60%.

The steep gas price increases following decontrol in 1978, and some state laws, brought the replacement of the standing pilot with an intermittent ignition device (iid) that increased seasonal efficiencies to the 67% to 71% range. A vent damper, which reduced the amount of conditioned

air vented between cycles, added another 8% or so.

Next came a family of gas furnaces that used power burners, induced draft, or recuperative heat exchangers. Most stopped just short of condensing the flue gases and produced seasonal efficiencies in the 80% to 86% range.

A pulse combustion boiler was introduced in 1980 and, two years later, it was joined by a pulse combustion furnace. Both had seasonal efficiencies well above 90% and, within three years, virtually every manufacturer offered a condensing furnace with seasonal efficiencies above 90%. A new efficiency class was born.

Some problems

These changes were not without problems. The corrosive nature of flue gas condensate, plus the corrosive chemicals introduced into the home environment from such things as cleaning compounds, caused many problems with early installations. Even furnaces that were not designed to condense flue gas did so under certain conditions.

Concentrated industry research has eliminated many of these early problems. Superior stainless steel alloys are used in secondary heat exchangers. New venting standards have been developed. And some use outdoor air for combustion. Contractor training also has become more widespread.

The efficiency market

Although some were unaware of it at first, there was a comparatively large group of homeowners eager to control their energy bills. They watched the evolution of efficiencies with more than passing interest. When they began replacing furnaces and boilers in good working order with high-efficiency units, a whole new market was born.

That market has been growing since 1983 and has required a change in contractor thinking. Instead of trying to make older, inefficient equipment work a little longer, they are convincing customers that it's wiser to replace it and save on energy bills. Importantly, this business is inherently more profitable for contractors and often takes them out of price competition with "fix-it" competitors.

A breakdown of manufacturer shipments by efficiency range reported by the Gas Appliance Manufacturers Association (GAMA) illustrates the scope of the change. The report includes upflow, downflow, and horizontal furnaces.

Last year, gas-fired furnaces with AFUEs of less than 65% — the standard for a quarter-century — accounted for only 9.3% of total shipments, down from 9.9% a year earlier. They accounted for 202,044 of the 2,168,114-unit total.

At the other end of the spectrum, 31.2% of the total in 1989, or 677,679 gas furnaces, had AFUEs of 80% or better. Of these, 362,913 gas furnaces, or 16.7% of the total, had AFUEs of 86% or better.

These 1989 figures represent a slight drop from the percentages recorded in 1988, the first since the shipment breakdowns were initiated. Continued moderate gas price increases in some areas and declining prices in other areas were blamed for the slackening in

demand for high-efficiency units. In 1988, 35.3% of gas furnaces shipped had AFUEs of 80% or better and, of these, 17.1% had AFUEs of 86% or more.

In between the two extremes, 38.7% of the gas furnaces shipped last year, or 837,124 units, had AFUEs of more than 65% but less than 71%, almost the same as the 38.6% a year earlier. Similarly, 20.8% of gas furnaces shipped in 1989, or 451,267 units, had efficiencies of 71% or more but less than 80%, up from 16.1% in the previous year.

The picture for oil furnaces, also reported by GAMA, revealed that 66% of the 178,980 oil furnaces shipped last year, or 118,129 units, had AFUEs of 80% or better. This is down a hair from the 67.3% share in 1988.

Another 31.8% of oil furnaces shipped in 1989, or 56,991 units, had seasonal efficiencies of more than 75% but less than 80%, up slightly from the 30.9% share a year earlier. Only 2.2% of oil furnaces shipped last year, or 3,860 units, had AFUEs of less than 75%, up from 1.8% in 1988.

Overall, then, almost one-third of gas furnaces and two-thirds of oil furnaces shipped last year already exceed the 78% AFUE mandatory federal minimum for furnaces manufactured in 1992. Here again, enough room has been left so that competition above that level is assured.

To date, most of the high-efficiency gas furnaces have been installed in existing homes. It should also be noted that, in the case of oil furnaces, high-efficiency burners represent little, if any, cost premium. Mobile home furnaces, which were examined separately by the Department of Energy, now must meet the same 78% minimum efficiency standard.

The industry still debates whether or not it's best to use outdoor air for combustion. Air-to-air heat exchangers, used more extensively in Canada and in Scandinavia to maintain ventilation and reduce humidity buildup in tightly insulated homes, have not been widely accepted in the U.S. And work continues on getting local code approvals for plastic gas distribution piping within structures.

According to some, the next step in heating efficiency will come from heat pumps, whether gas- or oil-fired or driven by a natural gas engine. Still in the developmental

stage, they could improve today's top efficiencies by 30% to 40%.

The days have long passed when the trend was toward smaller and smaller condenser coil surfaces and higher and higher fan speeds to achieve the best central air conditioner price in a market dominated by builder purchases.

As electricity bills spiraled upward, particularly in the South where cooling seasons are long, units destined for the more discerning add-on and replacement markets were quieter and more efficient. And, as home buyers became more aware of energy costs, more and more builders began opting for higher efficiencies as part of their energy conservation merchandising packages.

Today, at a time when replacements and add-ons represent more than twice the share of residential new construction and half of commercial shipments, energy efficiency has taken on much more importance.

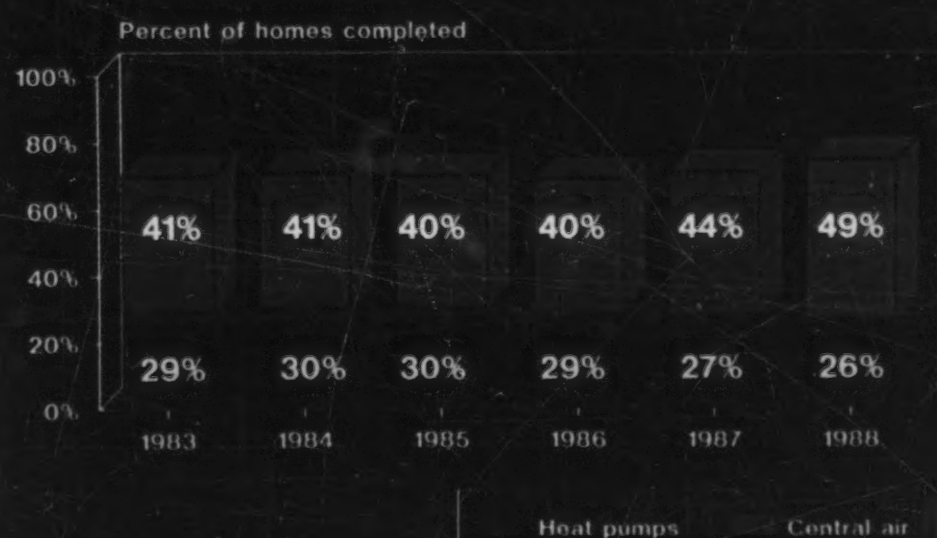
Within the industry, condenser surfaces were first expanded and, in the last few years, contracted as enhanced fin surfaces and turbulent-flow tubing designs were developed. Multiple-speed reciprocating compressors and condenser fan motors came into play. Compressor sizes were reduced and, within the past three years, scroll compressors were introduced. Sound levels were reduced dramatically.

Commercial units today are routinely equipped with multiple compressors to provide more capacity modulation and, as a side benefit, lower cost because of the economies of scale in the manufacture of smaller compressors. Scroll compressors are being used increasingly in smaller tonnage ranges while, in larger applications, screw compressors are being introduced.

The price of variable-speed drives for compressors and air handlers has become affordable. And although there are only a handful of units equipped with inverters in today's market, we believe that 1992 and 1993 will witness a rapid expansion in this area.

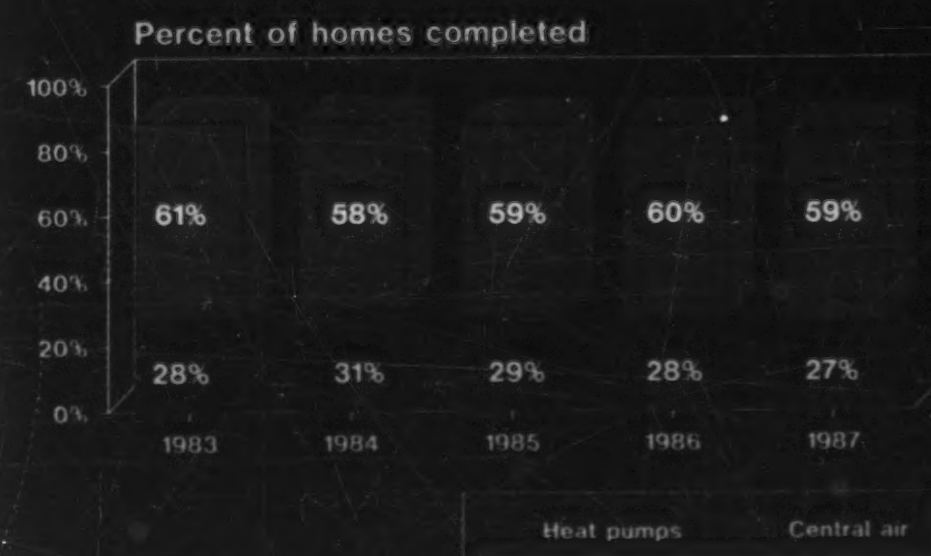
Humidity control, a casualty among some of the early high-efficiency air conditioners, is better understood by both manufacturers and contractors. The combination of variable speeds and microprocessor controls holds the promise of all but eliminating this

NEW SINGLE-FAMILY HOMES (with central air, heat pumps)



The News: Statistical Panorama 1990

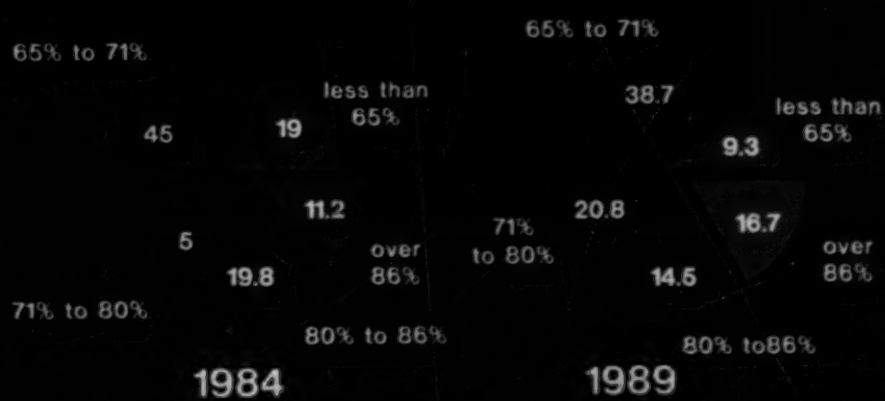
NEW MULTIFAMILY HOMES (with central air, heat pumps)



The News: Statistical Panorama 1990

COMFORT AND CONSTRUCTION

EFFICIENCIES Gas furnaces



Percent of total shipments expressed
in annual fuel utilization efficiencies (AFUE's).

The News: Statistical Panorama 1990

oil and LP gas industries, to the best of our knowledge, do not offer any efficiency incentives.

It should be noted that the number of commercial ice or chilled-water storage systems aimed at taking advantage of time-of-day electric rates is growing rapidly. Also on the horizon is a residential ice storage system that will enable air conditioning capacities to be halved.

Heat pumps

Electric furnaces for many years merely replaced electric resistance baseboard or ceiling cable so that ducted central cooling also could be provided. In the last decade, however, they played second fiddle to the heat pump.

Even though heat pumps have captured more than a quarter of

both single-family and multifamily home starts in recent years, that share eroded in 1988 for the fourth year in a row from a high of 30% of new homes.

This erosion is due primarily to the steep slide in new home starts in the South (from a 56% share of the national total to 39%), where 7 of 10 new-construction heat pumps are installed. The effects of electricity prices or competition from other fuels have been minor.

The initial reason for the popularity of the air-to-air heat pump was the lack of natural gas availability in many markets until deregulation in 1978. When gas became plentiful, it suffered from steep price increases and a weak infrastructure in the growth markets of the South.

Heat pumps still are largely a

southern phenomenon, as are electric furnaces. The furnaces tend to be used as a sole heat source in the South and as a backup heat source in the North. Both are favored when cooling seasons are long and when heating requirements are minimal.

A small market that surged briefly and then declined was the replacement of split-system air conditioners with heat pumps on gas and oil furnaces. The heat pump provides summer cooling and heating during the spring and fall. The furnace takes over for the winter. The switching point depends on relative fuel prices.

At least one manufacturer has introduced a second-generation heat pump designed for use with gas and oil furnaces. And contrac-

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problem without resorting to the energy penalty imposed by reheat.

Until 1976, we doubt that more than 15% of residential units (65,000 Btuh and under) shipped could be classified as high-efficiency units. At that time, we posted an EER (energy efficiency ratio) of 7.5 as the dividing line. That picture has changed dramatically.

The Air-Conditioning and Refrigeration Institute (ARI) reported that, on the 1989 shipments of unitary air conditioners in this class, the sales-weighted average SEER (seasonal energy efficiency ratio) was 9.25, up from 9.21 a year earlier.

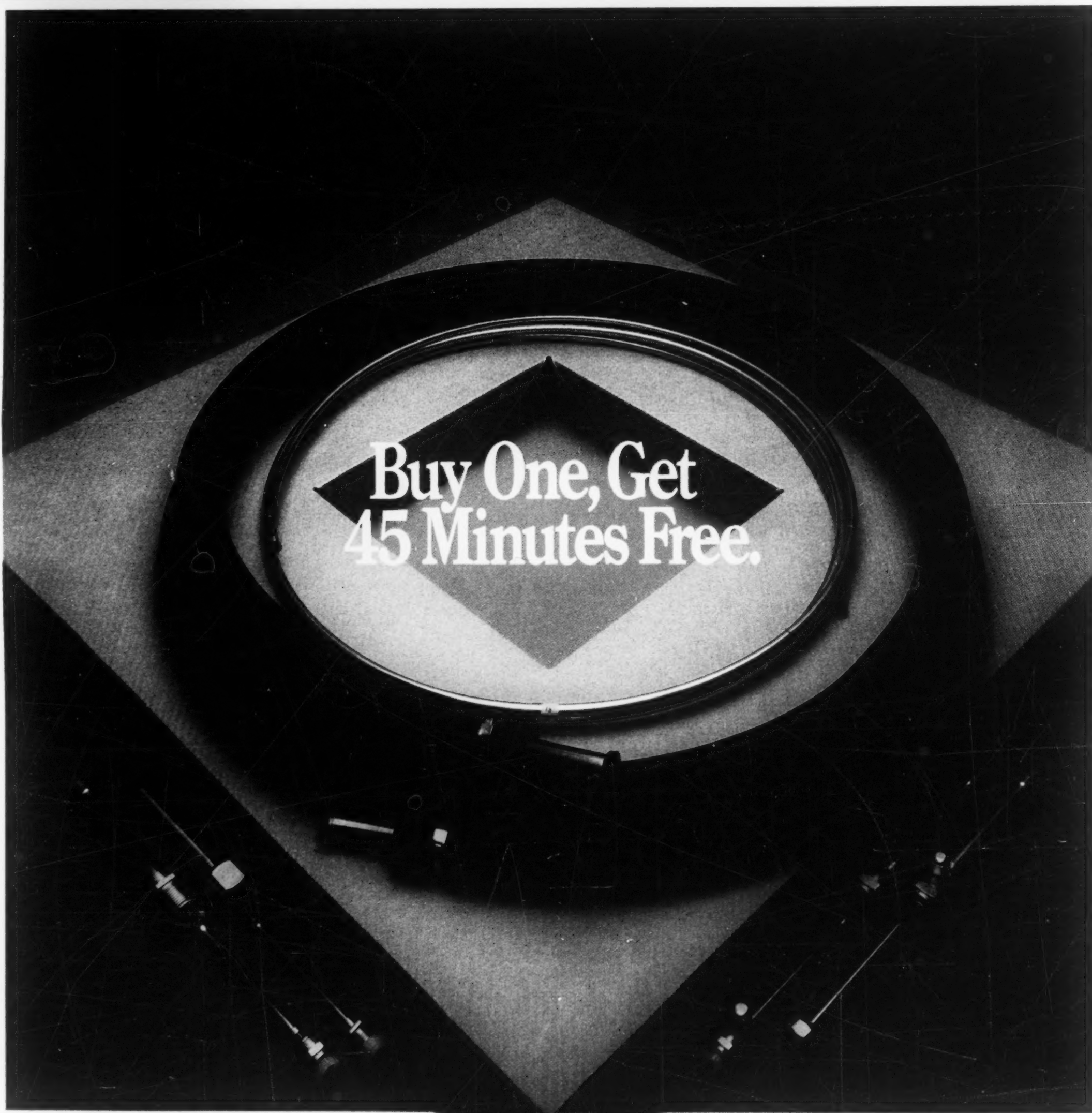
For perspective, it should be remembered that the mandatory minimum SEER that becomes effective in 1992 is 10. Not only are most units near or above that minimum today, but there appears to be ample room above the minimum for effective competition between manufacturers. Already there are units on today's market with SEERs above 17.

A major benefit of the federal mandate will be the elimination of state minimums. Not only have these state minimums created a number of mini-markets that destroy economies of scale, but the "me, too" and "me, toughest" syndromes promised much worse conditions in the future.

More important than state minimums in promoting higher cooling efficiencies and associated premium costs have been the many incentive programs launched by summer-peaking electric utilities seeking to avoid the addition of more generating capacity. They find a \$300 to \$600 incentive for higher-efficiency equipment is less expensive than \$1,500 a peak kilowatt for new capacity.

At its peak, more than 50 electric utilities offered an incentive of some type. We believe that number has dropped somewhat even as new programs were begun. Utilities drop incentive programs when they believe their objectives have been achieved. Others tell us that efficiencies have improved to a point where market forces are doing the job for them.

The number of gas utilities offering incentives to homeowners is much smaller and, for the most part, they have taken the form of no- or low-interest loans. However, a growing number are offering cash incentives to commercial and institutional customers who use gas for comfort cooling. The fuel



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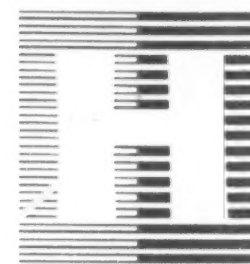
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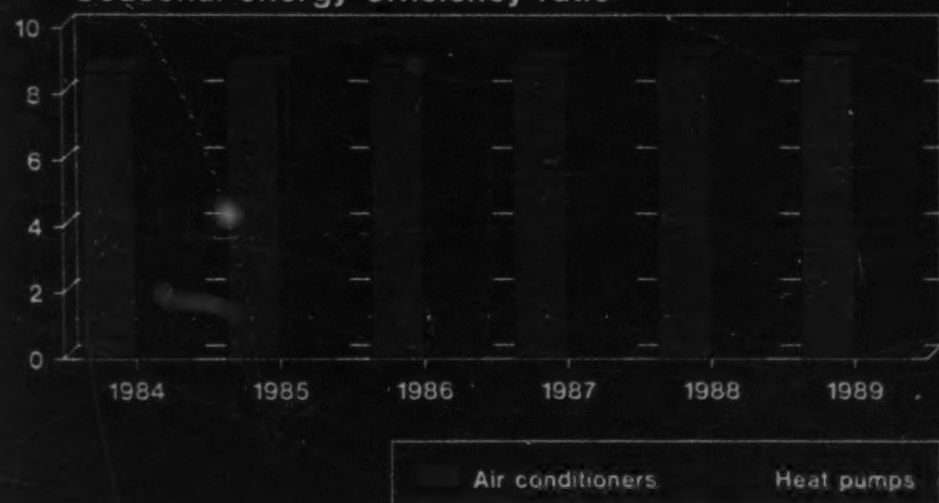
HALSTEAD

COMFORT AND CONSTRUCTION

EFFICIENCIES

Air conditioners, heat pumps

Seasonal energy efficiency ratio



The News: Statistical Panorama 1990

(Continued from Page 35)

tors report that, in areas where utility incentives reduce the premium cost, heat pumps still are replacing worn-out or inefficient air conditioners.

Integrated systems

A relatively new approach, the integrated system, is enabling gas utilities to compete with heat pumps in some markets. The system consists of a gas-fired hot water heater that provides both domestic hot water and space heating. An air conditioning evaporator or indoor heat pump coil can be added to the separate air handler containing the hot water coil.

Although these systems have yet to materially impact on heat pumps nationally, they have enabled gas utilities to regain some of the apartment and condominium market share lost when rising fuel prices prompted developers to use separate comfort systems along with separate meters. The gas industry, too, continues to push the development of a gas-fired heat pump.

The performance of air-to-air heat pumps has improved to a point where, in 1989, the 9.26 SEER sales-weighted average for all unitary heat pumps with capacities of 65,000 Btuh or less edged ahead of the 9.25 SEER average for their cooling-only cousins for the second year in a row. The 1988 average for heat pumps was 9.13 SEER.

It is significant that replacement air-to-air heat pumps, which by our calculations did not cross the 100,000-unit annual shipment threshold until 1985, topped 250,000 for the past two years, more than one-third of residential installations.

Though their numbers are much smaller, water-source heat pumps using closed earth-coupled loops have been making themselves felt in northern markets, particularly in the Midwest. They have been used in the South, particularly in Florida, where earth-coupled loops are unnecessary, for many years.

There are no reliable statistics for the number of earth-coupled closed-loop systems. However, *The News* estimates that, in 1989, that total was in the vicinity of 18,000 units. A new generation of earth-coupled units, introduced this month, promises a 50% increase in the already respectable efficiency of these units. However, high capital costs and individual engineering will limit growth somewhat.

Building on current technological trends and competition among manufacturers, the heat pump should demonstrate even higher efficiencies over the next five years, according to Tom Morron, vice president, marketing, at the Edison Electric Institute.

By the mid 1990s he expects:

- Scroll compressors will be widely used because of their added durability, efficiency advantage over reciprocating compressors, and quieter operation.
- Variable-speed compressor and fan motors will become more common, providing greater comfort, efficiency, and quieter operation.
- The combining of variable speeds and scroll compressors will make heat pumps more effective in northern climates as well as ad-

ding to their popularity in the South.

- Changing customer attitudes on long-term paybacks will influence their acceptance of heat pumps offering SEERs above 15

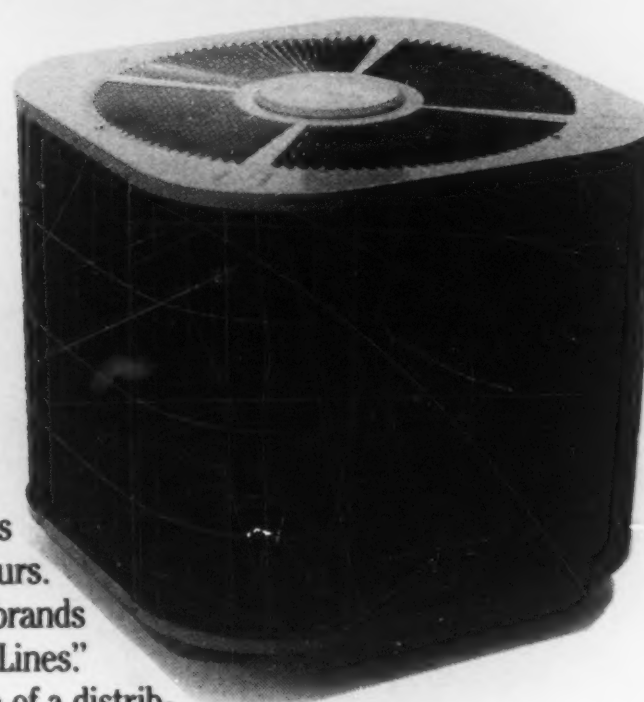
and HSPFs (heating seasonal performance factors) above 12.

- Integrated heat pumps, combining space heating and cooling with domestic hot water heating,

(Next Page, Please)

The world of the contractor also is changing dramatically. Not only must they find the time to train installation and service technicians to handle the new technologies, but the once-thin ranks of merchandising contractors are beginning to swell.

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COMFORT AND CONSTRUCTION

(Continued from Preceding Page)
will become more popular because of energy cost savings.

• Cost reductions caused by increased competition will help increase the number of earth-coupled heat pumps installed.

Although we are unable to present the 1989 breakdown of new home characteristics, we can

provide somewhat more complete Bureau of the Census statistics for 1988.

The tables found elsewhere in this issue provide a regional breakout, a necessary addition for a nation of sharp regional disparities. It's also important to note that these figures are based on home completions, not on home

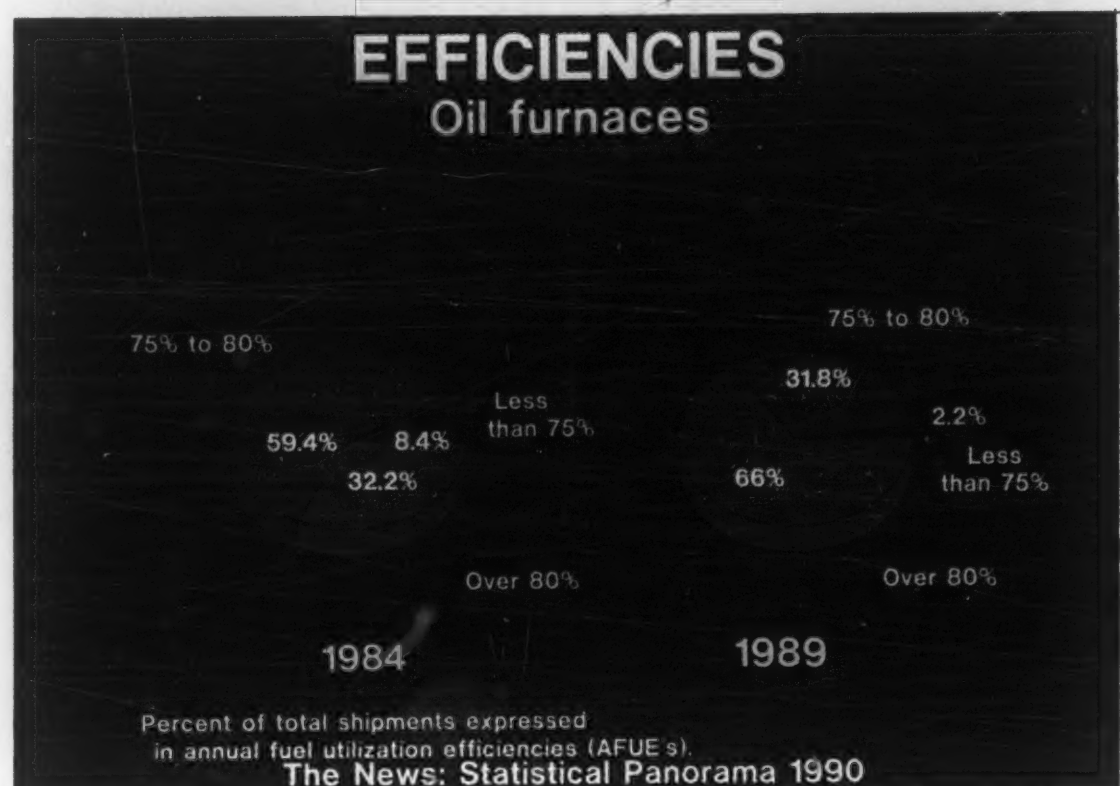
starts. The total number of completions is not particularly relevant.

Looking at fuels for single-family homes, the share for gas has escalated steadily from 43.4% in 1985 to 52% in 1987 and 54% in 1988. Oil's share has risen from 2.6% in 1985 to 5% in 1987 and 6% in 1988.

Both gains have come mostly from electricity, which dropped from 49.9% in 1985, to 40% in 1987, and to 37% in 1988. Other fuels also declined from 4.1% in 1985 to 3% in each of the last two reported years.

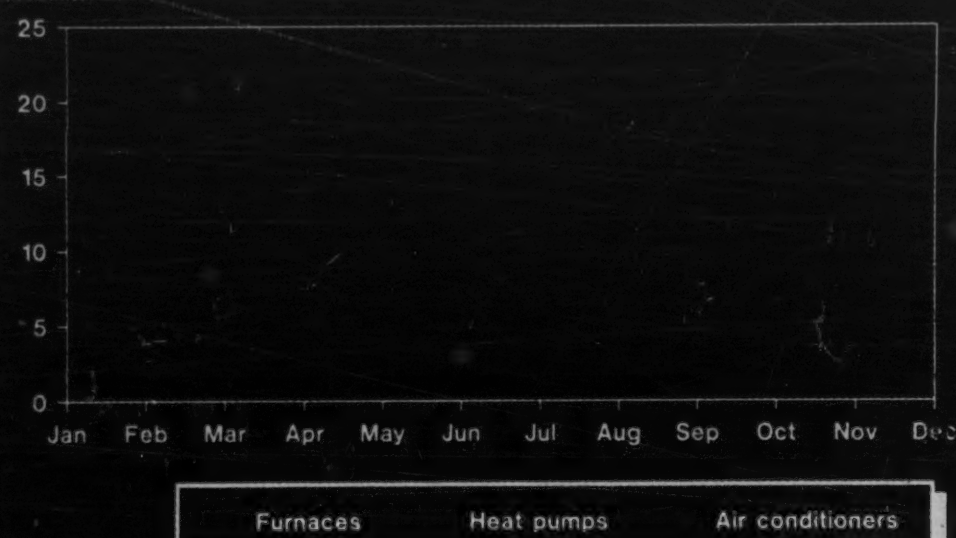
Much the same story was true for multi-family home completions. The gas share escalated from 30.2% in 1985 to 41% in 1987 and 44% in 1988. The electricity share declined from 68.7% in 1985 to 56% in 1987 and 54% in 1988.

The shifts, we believe, are due both to geography and fuel price changes. Most of the gains for gas and oil over electricity, we believe, have come about because of the reduction in construction in the South, bastion of the heat pump and the electric furnace. The South's share of total home con-



INDUSTRY SEASONALITY

(Residential heating and cooling)



Market Facts (IMRI) 1987

struction, over the past four years, has shrunk from 56% to 39%.

During the same period, the industry has witnessed increases in home construction in the Northeast, bastion of oil, and the Midwest and West, bastions of gas. Home construction in the Northeast, however, has slipped badly over the past three years — a factor that is proving costly to the shares of both oil and hydronics in

new homes.

The penetration of central air conditioning in single-family homes completed in 1988 was 75%, up from 71% in the previous year. The increase from a plateau of about 70% that held for several years probably was due to two hot summers in a row and the higher proportion of expensive trade-up homes being built in recent years.

Air conditioning in multi-family



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COMFORT AND CONSTRUCTION HOUSING AND CONSTRUCTION

units held even at 84% for each of the years 1987 and 1988, despite a drop in the West from 71% to 63%. Both the Northeast and Midwest showed gains while the South, at 99%, stayed even.

Significantly, the penetration of central air conditioning in single-family homes continued to increase across the country. The picture: Northeast 52% in 1988, up from 48% in 1987; Midwest 71% in 1988, up from 67%; South 94% in 1988, up from 92%; and West 60% in 1988, up from 55%.

The penetration of heat pumps in single-family homes completed in 1988 slipped again to 26% from 27% a year earlier. It had been 30% in 1985. Although the Midwest held even at 6%, the Northeast (at 13% in 1988) and the South (at 47%) dropped marginally and the West dropped from 15% to 12%. Similarly, the share of heat pumps installed in multi-

family homes completed in 1988 dropped slightly from 27% in 1987 to 26% in 1988.

The preference for hydronic heating systems installed in single-family homes held steady through both years at 7% of those completed, but that share is expected to drop in 1989 because of the 24% decline in new home starts in the Northeast. The share for electric baseboard, panel, and radiant heat declined slightly from 5% of the single-family homes completed in 1987 to 4% in 1988. The Northeast continued to account for half of this market.

We also note that central air conditioning penetration in the mobile/manufactured home market dropped a hair from 49% of homes shipped in 1987 to 48% in 1988. Regionally in 1988 it broke down like this: Northeast 18%, Midwest 40%, South 60%, and West 33%.

Since its decade peak in 1986, the U.S. new home market has really been two markets in one. The single-family segment, despite sharp regional disparities, has almost held its own while multifamily construction plunged.

Total private housing starts in 1989 amounted to 1,374,400 units, down 7.6% from the 1,488,100-unit total for the previous year. The 8.2% decline in 1988 followed a 10.2% drop from the 1986 peak of 1,805,400 housing units.

Now for the two markets.

Single-family home construction, led by a strong trade-up segment of large custom homes, totaled 1,001,700 units in 1989, down 7.4% from the 1,081,300 new single-family homes started in 1988. It was the seventh year in a row that single-family home construction topped the one-million mark and was only 8% below the seven-year average of 1,090,400 units.

Multifamily starts, on the other hand, accounted for 372,700 housing unit starts in 1989. That was an 8.4% drop from the total of 406,800 units started in the previous year and was but the latest in

a steady decline from a peak in the mid-1980s when starts averaged 650,000 units. Plagued by pre-tax reform overbuilding, rent controls, and a national vacancy rate approaching 10% among buildings with five or more units, the slide promises to continue for at least another year.

Declines were registered in all four regions last year. The worst performance was turned in by the Northeast, where housing starts dropped 24.1% from 235,300 units in 1988 to 178,600 last year. The 1989 level for the Northeast was down almost 40% from the 1986 peak of 293,000 units.

Home construction in the South, which almost singlehandedly led the industry and the nation out of the 1982 recession, fell again last year. The 535,700 starts in the South in 1989 were down 6.8% from the 1988 total of 574,900 starts. The decline has been a steady 43% drop from the 935,000 homes started in the South in 1983, but there are indications that 1989 will mark the bottom of the spiral.

The 1989 declines in the Midwest and the West were minimal.

Starts in the Midwest, at 265,900 units last year, were down 3% from the 1988 total of 274,000 units. New home construction in the West, at 394,300 units last year, was down only 2.4% from the 1988 total of 403,900 units.

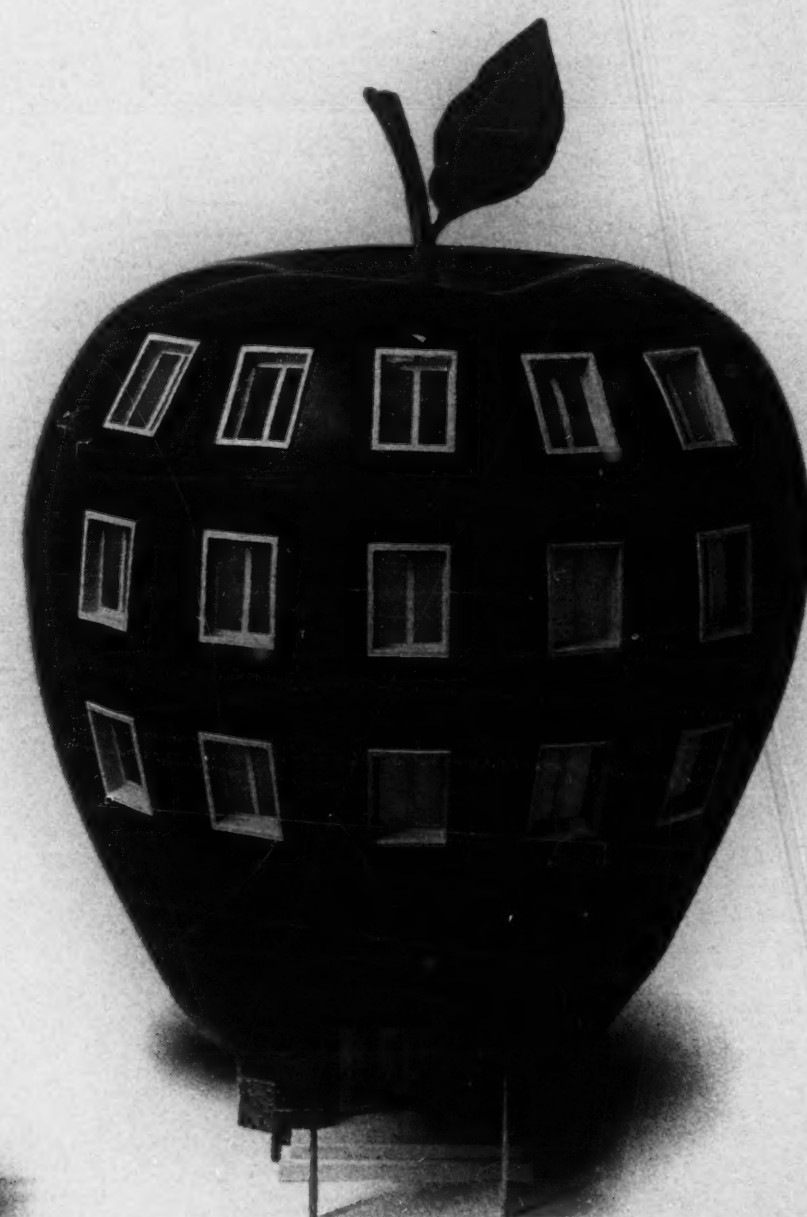
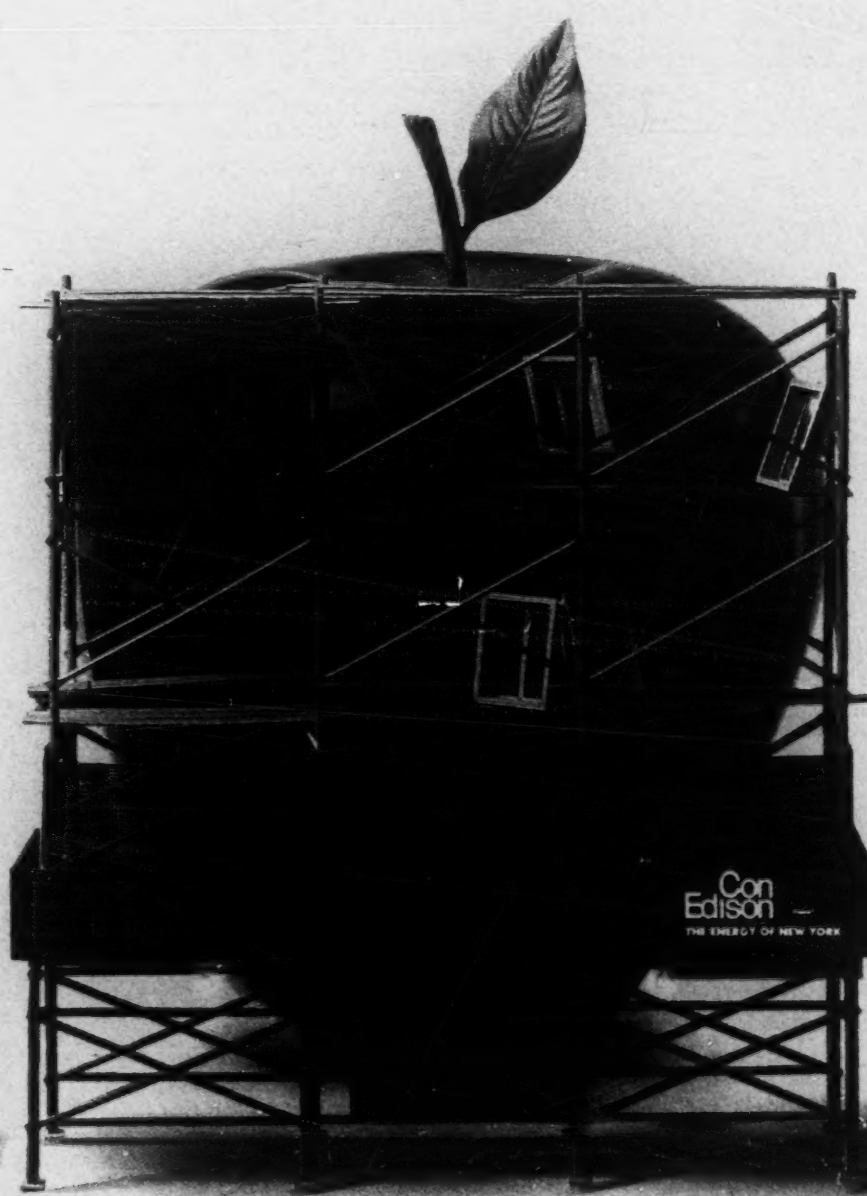
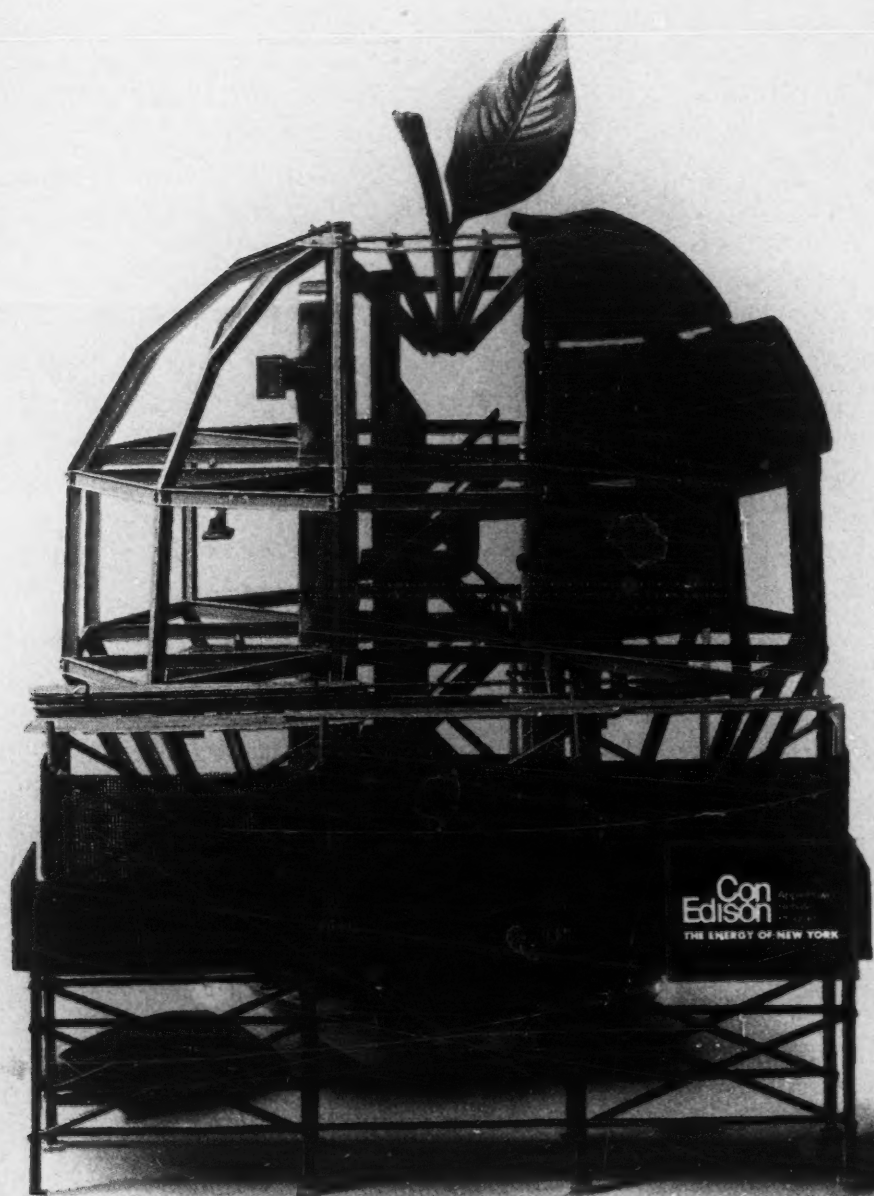
Developer loans

Before taking a look at what's in store for the remainder of 1990, it's imperative that we take a look at what's happening to the nation's savings and loan institutions — the thrifts — and the impact of those events on near-term housing construction.

In order to liquidate the hundreds of billions of assets held by insolvent thrifts, Congress voted \$164 billion in long-term funding for Resolution Trust Corp., the new agency charged with the job. Many of the thrifts, which originated more than 60% of home mortgage loans, are now out of business or close to it. And many of them are in the South, which still accounts for half of U.S. home starts.

That's the easy part. The Federal National Mortgage Association (Next Page, Please)

Each Statistical Panorama includes the latest data available. Sources frequently revise their previous year's figures, which explains apparent discrepancies between the latest and earlier published data. Where sources give significantly varying information, that data is mentioned.



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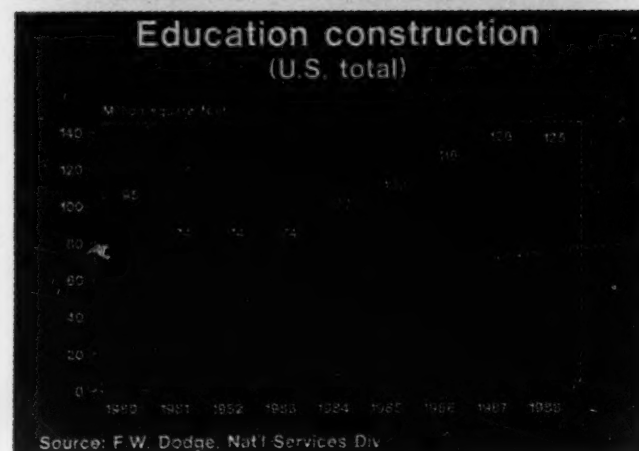
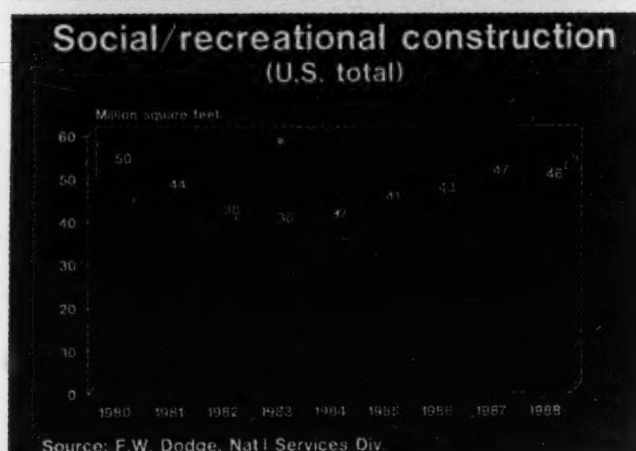
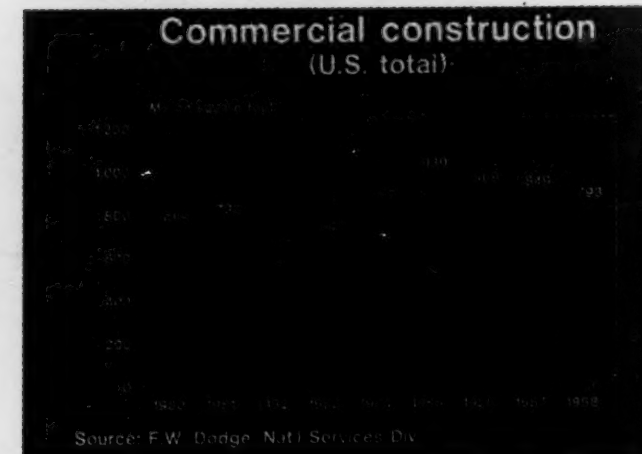
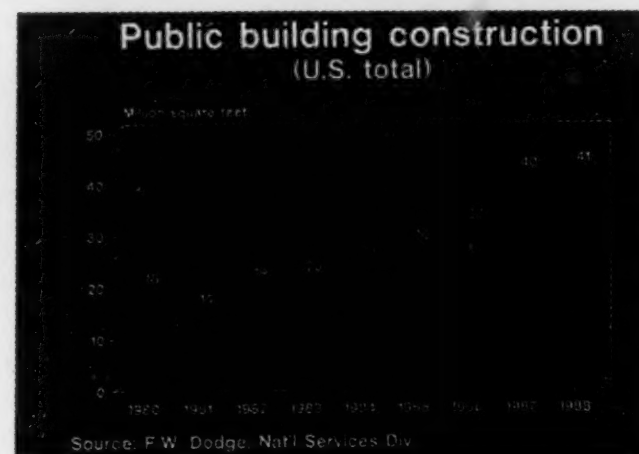
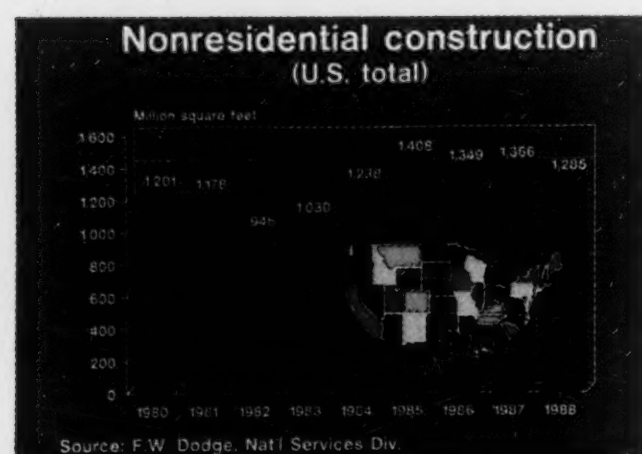
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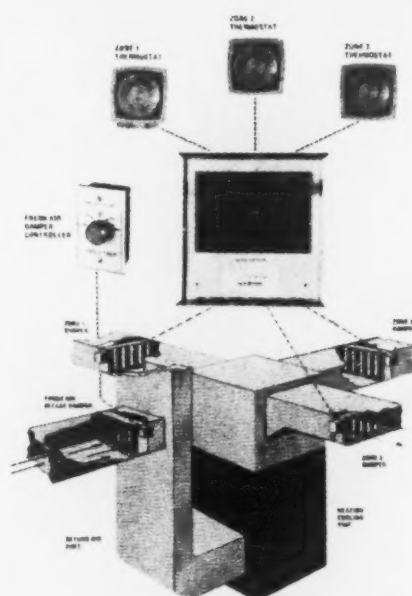
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Circle 40

(Continued from Preceding Page)

tion (Fannie Mae) assures us that the secondary market of mortgage-backed securities is strong and is growing. There is no shortage of mortgage money, but both home buyers and developers will be slowed in finding new sources (banks, surviving thrifts) of originations.

The new regulations governing thrifts contained in the Financial Institutions Reform, Recovery, and Enforcement Act of 1989 (FIRREA) promise to make it more difficult for at least 40% of builders to obtain acquisition-development-construction (ADC) loans.

The new regulations require that 70% of a thrift's portfolio be invested in housing-related assets but they are prohibited from making any direct equity investments in real estate itself. They can participate in joint ventures but, after five years, must capitalize the venture separately.

The more stringent capital requirements will send many builders to other lenders, such as banks, for ADC loans. Many thrifts have had to reduce assets in order to meet capital ratios.

Those that fail capital requirements are subject to further growth and investment restrictions. Both strategies discourage ADC loans.

The most troublesome provision for builders is that which limits the maximum amount a thrift can lend to any one borrower to 15% of its capital. It had been 100%. A special exception allows residential development loans to one borrower up to 30% of its capital up to \$30 million, provided it meets its new capital requirements.

Impact

In a survey conducted by the National Association of Home Builders (NAHB), 31% of builders said they had received a notice from a thrift announcing a reduction in future loans. Of those, 52% said it has affected their building plans. And another 20% said thrifts have told them they will no longer enter into joint ventures or equity participation arrangements with builders.

That doesn't mean money will not be available in sufficient quantity. More than half of builders already get ADC financing from

commercial banks or mortgage companies. But it will mean that builders depending on thrifts will have to obtain that money from several rather than one lender, or set up an arrangement where the thrift acts as the lead in arranging the rest of the money from other thrifts. And all of that takes time.

For perspective, it must be remembered that in 1989, most builders started less than 10 units. But the 9% of builders who began more than 100 units accounted for 67% of total starts. The 74% of builders who began less than 25 units last year accounted for only 13% of total starts.

1990 forecast

Despite moderate interest rates, continued slow growth in both the economy and net job formation, and an overbuilt multifamily sector will mean a flat 1990 for new home construction. The outlook for 1991 is a bit better.

The Northeast, the hottest market in the mid-1980s, has experienced 8%, 12%, and 24% cutbacks in new home construction over the past three years. Home price increases, which escalated at an alarming rate in the peak period, have slowed to a point where a few questioned whether a home was a good investment.

Unemployment rates in the Northeast, among the lowest in the nation for several years, still are below the national average. But slumps in the financial and computer industries, and expected slowing of defense spending, have led to an exodus from the most heavily populated regions.

These factors, together with the large inventory of unsold expensive single-family homes and condominiums, lead us to predict another 10% drop in 1990 housing starts to 160,700 units.

Despite a moderate unemployment problem in the larger industrial states and a net reduction in population, the Midwest housing market continues to be a model of slow but steady growth. The 265,900 Midwest new home starts in 1989 accounted for 19.4% of total U.S. production, a regional share not reached since 1979.

The Midwest was the only region where more new homes were sold in 1989 than in the previous year. We look for a modest increase of 3% in new home starts in 1990 to bring the Midwest to-

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Circle 1

HOUSING AND CONSTRUCTION

tal to 273,900 units.

Housing start rates in the South, with its diversified economies, have varied widely. Hurricane Hugo hurt South Carolina late in the year. And although housing markets in the Oil Patch states (Texas, Louisiana, Oklahoma) have firmed considerably, spot weaknesses in the South Atlantic states have eliminated any overall growth.

Looking ahead, we expect another decline for the South but this time it will be only 3% to 520,000 units. It probably will be 1991 before this region shows an increase and then, too, it will be modest. However, it must be remembered that this region still produces 39% of the nation's housing starts.

Despite high prices along the West Coast and a weak multifamily market, new home starts in the West declined by only 2.4% last year. In fact, the West's 270,300 new single-family home starts in 1989 accounted for 27% of the nation's total and the highest share in 12 years.

Continued strength in new home sales, particularly in states other than California, should continue to inject vitality into this market. We look for an 8% increase in new home starts in 1990 in the West to 520,000 units.

The multifamily market, hit hard by tax shelter-inspired overbuilding in the 1985-1986 period, still suffers from high vacancy rates and an overhang of unsold condominiums in the Northeast. Vacancy rates still approach 10% for buildings with more than five units, which accounts for a high percentage of rental apartments.

Although there are some areas showing renewed strength, we feel that multifamily starts will decline again in 1990, this time by 6% to 350,000 units. It might be a bit less were it not for the anticipated slowdown in obtaining financing for large projects caused by the thrift upheaval.

The total for 1990, then, would be 1,380,000 new home starts, up just a hair from 1989 experience. And even though 1991 may show a modest increase, demographics show quite clearly that 1.3 to 1.4 million housing starts will be the average for the 1990s.

The top 25

The F.W. Dodge Division of McGraw-Hill, Inc., has produced a list of the top 25 metropolitan housing markets in 1989, a list that changes from year to year.

For example, Dallas-Fort Worth led the list as late as 1984 but failed to make the 1989 list. And although Sun Belt cities still are evident, so are those with more northerly exposures.

The top 25, with the number of starts in 1989, and the comparable number for 1988 in parentheses, follow:

Los Angeles-Long Beach 45,922 (45,462); Riverside-San Bernardino, Calif. 42,131 (52,539); Metropolitan Washington, D.C. 37,555 (50,666); Atlanta 32,791 (43,443); Las Vegas 26,657 (21,425); Chicago 23,874 (25,475); Seattle 21,065 (22,826); San Diego 20,507 (21,560); Orlando, Fla. 20,453 (21,899); Baltimore 20,277 (15,668); Detroit 20,069 (24,236); West Palm Beach-Boca Raton-Delray Beach, Fla. 18,050 (18,102); Philadelphia 18,039 (25,227);

Sacramento, Calif. 17,969 (17,659); Minneapolis-St. Paul 17,923 (21,465); Miami-Hialeah, Fla. 17,553 (16,719); Ft. Lauderdale-Hollywood-Pompano Beach, Fla. 15,294 (16,104); Phoenix 15,042 (22,280); Tampa-St. Petersburg-Clearwater, Fla. 14,836 (19,702); New York 13,755 (11,926); Portland, Ore. 13,423 (9,311); Oakland, Calif. 12,887 (13,563); Charlotte, N.C. 11,729 (11,357); Anaheim-Santa Ana, Calif. 11,357 (17,641); and Boston-Lawrence-Salem-Lowell-Brockton,

Mass. 10,975 (15,124).

Mortgages

Even though the 30-year fixed mortgage rates forecast for 1990 at between 9.5% and 10.25% may appear to be moderate when compared to the 16% and 17% rates of the early 1980s, they are still no bargain.

Largely because of the federal budget deficit, the U.S. must keep interest rates high in order to attract the foreign capital — mostly from Europe and Japan — needed

to finance the deficit. This means that, when foreign nations raise interest rates in order to curb inflation at home, the U.S. must also raise its rates in order to continue attracting capital from those nations.

It is this phenomenon that has been blamed for the rise in bond rates. Some economists believe that mortgage interest rates would be 2% to 2.5% lower if the federal deficit were eliminated or, at very least, a believable plan for eliminating the deficit were put

forward. Just as importantly, the Federal Reserve Board no longer has the degree of control over interest rates it once had.

Another factor influencing interest rates is the determination of the Federal Reserve Board to reduce inflation to zero. Despite slow growth in the economy and several small reductions in short-term rates by the Board, core inflation continues at about a 4.2% rate and shows signs of increasing slightly. And, with the nation

(Page 44, Please)

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HOUSING AND CONSTRUCTION

(Continued from Page 41)
close to full employment, any future reductions are not likely to have much effect on inflation.

Despite the probable elimination of more than 300 thrift insti-

tutions, and much more strict lending limits for the remaining 2,600 thrifts, there appears to be no shortage of mortgage money. The secondary market, funded by mortgage-backed securities that

have proven popular with foreign and institutional investors, has been strong and promises to become even stronger as the bond market weakens.

It should be noted that since adjustable-rate mortgages (ARMs) were introduced into the marketplace in 1984, their share increased rapidly as fixed-rate mortgage rates increased. By 1988, ARMs had captured two-thirds of the mortgage market despite a narrowing between fixed and adjustable rates.

Part of the reason for the continued strength of ARMs was the heavy discounts offered by thrifts for the first few years of the mortgage. Those discounts disappeared in early 1989 with the federal legislation and, by year's end, the ARMs share was reduced to about 24% of the market. It is expected to drop further but not disappear. It is still a favorite among those who must cope with corporate transfers that may only last for a few years.

Demographics

The direct determinant of housing demand is not population growth but household growth. It can vary dramatically with short-term economic conditions and is affected over longer periods by social trends, such as marriage and divorce rates and whether young adults live alone, with roommates, or with their parents.

Changes in population by age will be the most important factor affecting housing demand in the 1990s. The population aged 25 to 34 years, the primary household formation ages, began to fall in 1988 and will continue to fall throughout the decade ahead.

On the other hand, the population aged 35 to 54 — the prime trade-up years — will grow rapidly. Household formations averaged about 1.3 million per year in the 1980s and, over the next five years, the average is likely to be about 1.2 million. During the last five years of this century, the average will be about 1.1 million household formations a year.

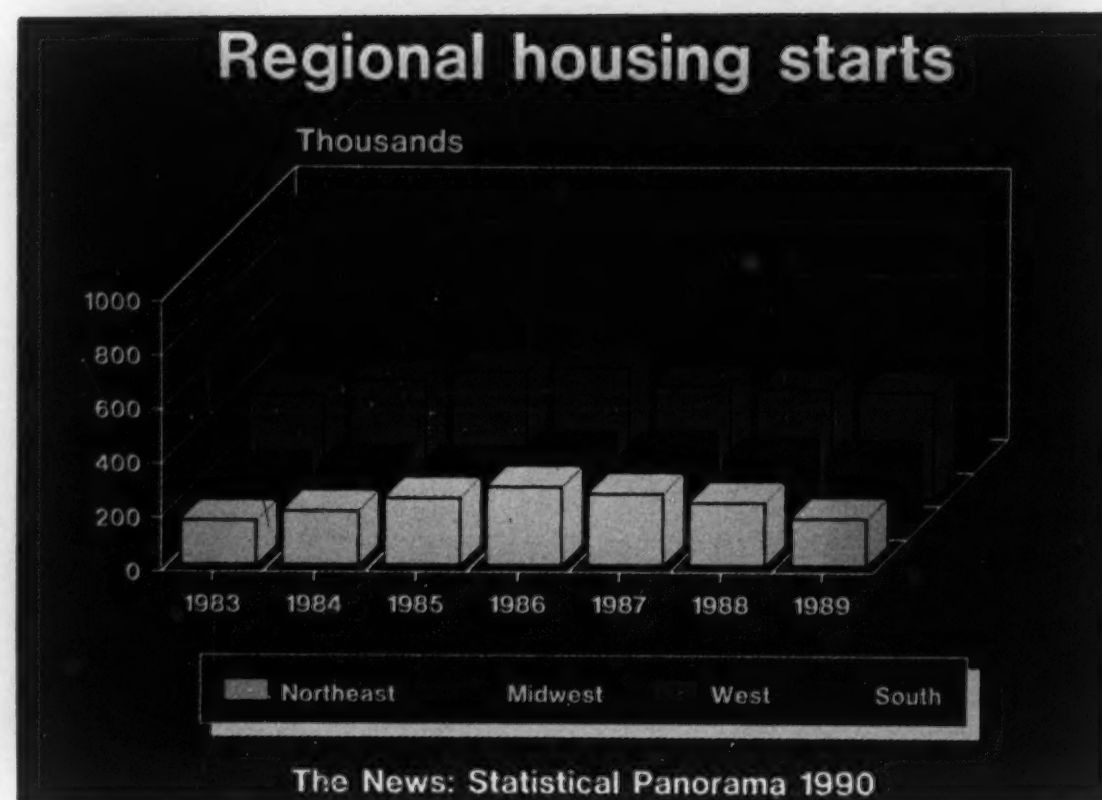
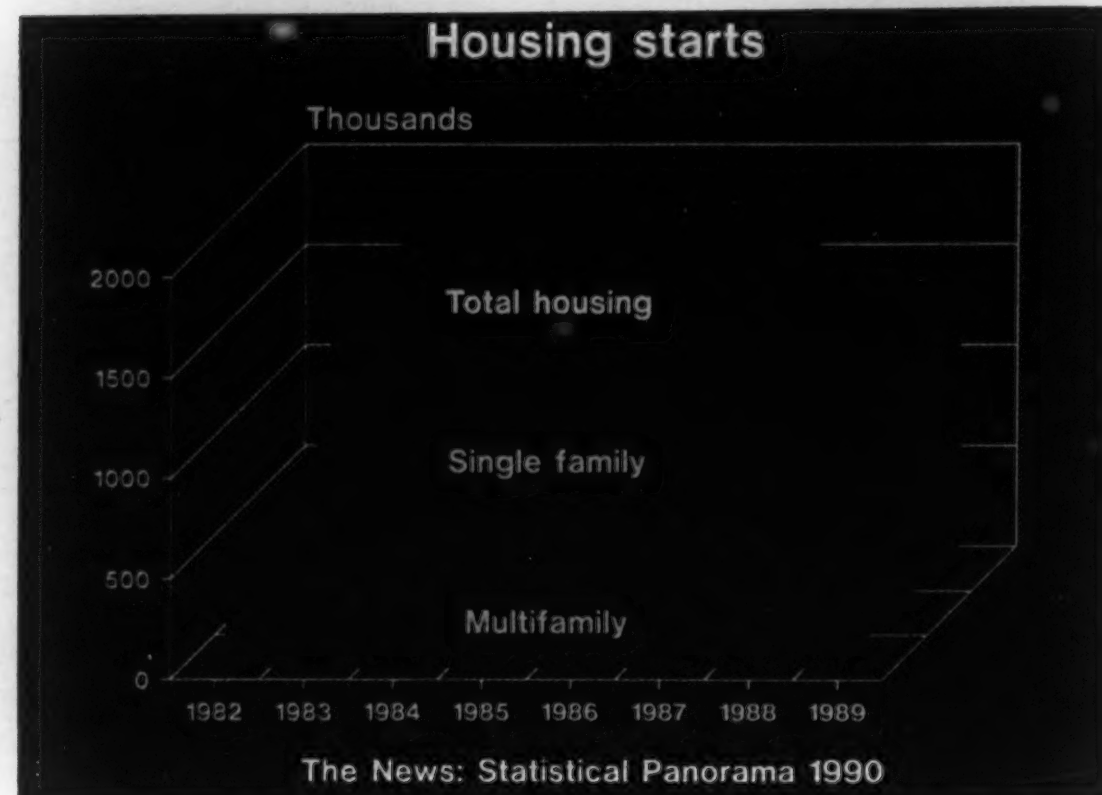
That means, according to NAHB, that housing starts in the 1990s will only average 1.3 million to 1.4 million a year. That compares to 1.5 million in the 1980s. Over the next three years, however, NAHB says starts should average 1.4 million units.

According to the National Association of Realtors (NAR), changes in the behavior and wealth of existing households may be more critical to future housing demand than changing age structure. It sees a greater need for niche production and marketing.

NAR stressed the shift from married to single and nontraditional households, increasing migration and mobility rates, and the growing disparity of ability to purchase housing because of a shrinking middle class.

Affluent households are able to increase their housing consumption, as demonstrated by the burgeoning trade-up market. But, NAR adds, households near the lower end of income distributions — whether because of lagging real earnings, increasing single-parent households, or misfortune — are having difficulty affording suitable housing.

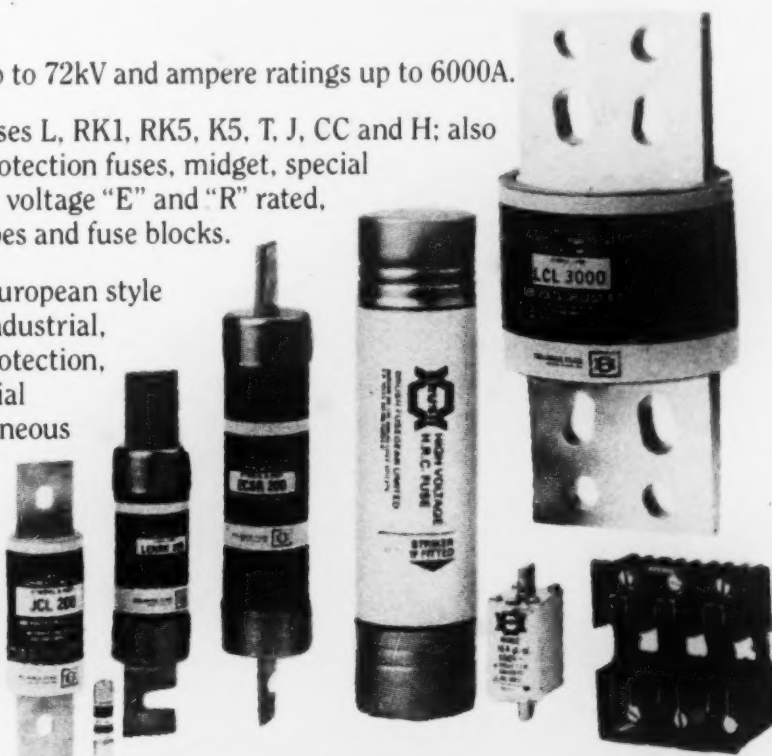
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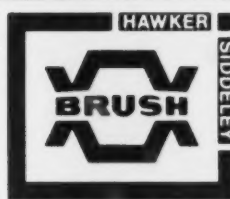
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rate peaked in 1980 at 65.6% and has been dropping since then. The decline is most pronounced among households in the 25 to 29 age group, which fell from 43.3% in 1980 to 36.2% in 1988. For households in the 30 to 34 age group, the rate fell from 61.1% to 52.6% in the same time period.

And just as first-time buyers are having more difficulty finding affordable housing, renters also are faced with an affordability crisis. The rent burden has become particularly onerous for young single-parent families, where rents have increased from 34.9% of their income in 1974 to 58.4% in 1987.

The median price of a new home sold late in 1989 was \$120,400, up from the median of \$116,400 recorded in 1988. The median price of an existing home was \$92,100 in October, 1989, up from \$88,900 in the same month a year earlier.

In 1983, as the housing industry emerged from the recession, first-time home buyers represented 47.7% of the single-family home market. In 1989, that share had been reduced to 30.9%. More than two thirds of the single-family home market (69.1%) were trade-up homes with a full array of amenities.

This move to larger homes is borne out by the construction contract totals reported by F.W. Dodge Division of McGraw-Hill, Inc. Despite a 7.6% decline in the number of housing starts in 1989, the value of residential construction, at \$120.4 billion, was only down 1% from the 1988 total of \$121.9 billion.

It was interesting to note that, in NAHB's breakdown of the costs

of a \$159,900 home in the Chicago area, the cost of the heating, ventilating, and air conditioning system was listed as \$2,900. The cost of an improved lot, at \$38,657, home construction costs of \$96,843, and the builder's profit and selling costs, at \$24,400, made up the total.

The Mortgage Bankers Association reported that the mortgage delinquency rate (30 or more days past due) was 4.53% in the second quarter of 1989. Over the past decade, it peaked at 6.06% in 1985 and has been sliding downward ever since.

Of the 388,500 apartments completed in buildings with five units or more in 1988, a total of 76,400 — or 20% — were condominiums or cooperatives. The number of condominiums has declined steadily from a high of 143,600 units in 1984. Condominium starts were down 11% to 64,000 units through September, 1989.

Mobile homes

Manufacturer shipments of mobile homes totaled 198,100 units in 1989, according to the Bureau of the Census. That represents a 9% decline from the 1988 total of 218,300 units.

Shipments of these site-delivered homes, popular with retired people and those with moderate incomes, are not counted in the official housing statistics.

For the past four years, mobile homes have amounted to 20% of private single-family site-built homes, down from 26% in 1985. They accounted for 36% of single-family home starts in recession-ridden 1982.

REPLACEMENT MARKET

GAS FURNACES

New homes, replacements



The News: Statistical Panorama 1990

At a time when new home starts are slumping and the economy is growing at a snail's pace, replacements represent the glue that holds major markets together. For contractors, replacements provide a stabilizing force that enables them to shift emphasis with changing economic conditions.

The surge in comfort cooling and heat pump replacements, together with the strong homebuilding years of the 1970s, have kept residential comfort heating and cooling equipment shipments at or near record levels despite declines in new home starts for the last three years.

Although substantial home heating replacement sales have been a fact of life for many years, it is a relatively recent phenomenon for the younger central air conditioning and heat pump markets. Recognition of this factor has sparked new marketing approaches by both contractors and manufacturers.

Contractors who once regarded service as a necessary nuisance now are putting increasing emphasis on this prime route to replacement sales. And more aggressive contractors are developing marketing strategies aimed at uncovering additional potential customers who would be interested in upgrading equipment for efficiency reasons.

Several manufacturers have revised their marketing stance to

both condition homeowners about potential energy bill savings and to get close to contractors who are exploiting the replacement and add-on markets.

A couple are offering contractors free marketing advice if they will work with the manufacturer in developing this new potential. A few are buying independent wholesale outlets to get broader distribution in key markets. And one that formerly only sold to contractors has, through acquisition, set up another company to sell through distributors as well.

In addition to the sustained high level of consumer awareness about the wisdom of upgrading equipment efficiencies, many electric utilities continue to offer rebates to both residential and commercial customers who meet specific minimums. And although gas utilities rarely offer efficiency incentives to residential customers, many offer rebates to commercial customers who switch significant loads to gas.

The percentage of residential replacements within shipment totals varies widely among product groups. Last year, for example, almost two-thirds of gas furnace shipments were replacements and eight of 10 oil furnaces. Three-quarters of boiler shipments were replacements.

The central air conditioning market, which once depended heavily on new home starts and

the new light commercial construction that followed, now depends on replacements for more than half of its volume. And nearly a third of heat pump shipments last year were replacements.

A macro view

Before examining individual industry markets, it's significant that national expenditures for residential alterations and repairs, in current dollars, have grown from \$45.2 billion in 1982 to \$101.1 billion in 1988, an increase of 124%. The National Association of Home Builders (NAHB), which estimated a 1989 total of \$102 billion, said the real growth in constant dollars came between 1983 and 1986. It has since leveled off.

The 1988 total is 7.5% greater than the \$94 billion recorded in 1987. NAHB said that, of the \$60.8 billion spent remodeling single-family homes in 1988, \$27.6 billion was spent on homes built before 1960. Regionally, \$31 billion was spent on homes in the Northeast, \$21.3 billion on Midwest homes, \$27.1 billion on South homes, and \$21.6 billion on homes in the West.

Heating and air conditioning alterations and repairs, at \$7.46 billion in 1988, accounted for 7.4% of total expenditures. It also represented a 16.4% increase over

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How does your firm stack up--

(Continued from Preceding Page)

have gross profits in the 45% to 55% range. Service work is labor-intensive, resulting in its being overhead-intensive. Use your budget to compare what it is vs. what it ought to be.

Some other key measures should also be analyzed:

Accounts receivable. Collecting money is always an issue, and

most hvac contractors say they do a good job. But very few calculate the hard facts of their average age of accounts receivable.

This is done by dividing accounts receivable by net sales and multiplying that figure by 365 days. Here, the average age is 33.4 days. This is probably lower than for most hvac contractors, unless they are very service-intensive

with a lot of c.o.d. business. Most companies would average around 35 to 45 days, even including retainage.

Age of inventory. This is an important measure of inventory control. For most profitable hvac contractors who have to carry inventory the average age is 45 days or less.

This means you should be able to turn this inventory a minimum of eight times per year. Most contractors need to keep some inventory to perform repetitive types of jobs. This can be financially rewarding if quantity discounts are applicable.

However, high average age of inventory can only indicate inefficient purchasing and poor inventory control. Improving this can improve the company's liquidity position.

The calculation is simple: divide inventory (\$83,000) by the cost of materials used in that period (\$633,025) and multiplying the sum by 365 days: 48 days.

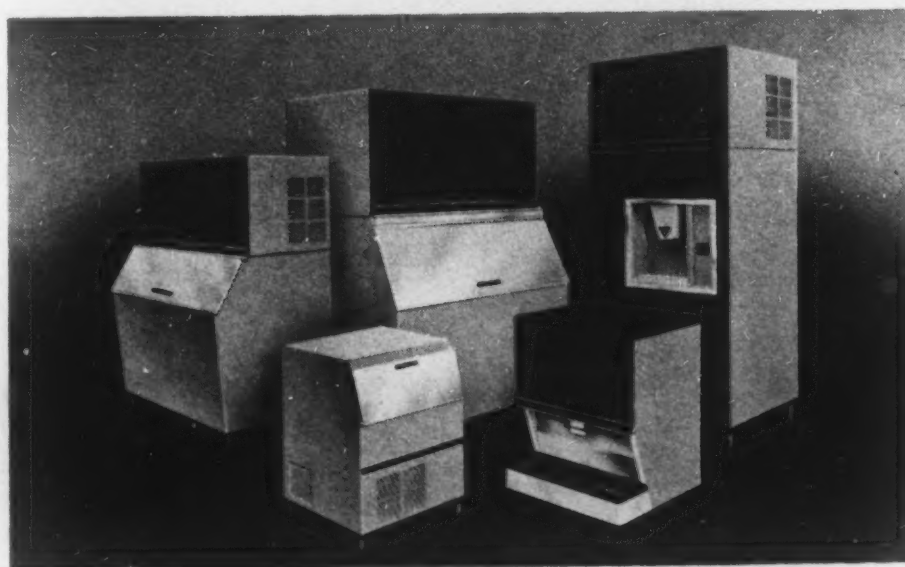
Age of accounts payable. This shows the average number of days from the time the company recognizes a payable unit until it is paid. Divide accounts payable (\$80,100) by the annual costs of materials and subcontracts (\$653,075), multiplied by 365 days. The average age is about 45 days.

This is not high for the hvac contracting field, but it indicates that our example contractor may sometimes fail to take advantage of trade discounts.

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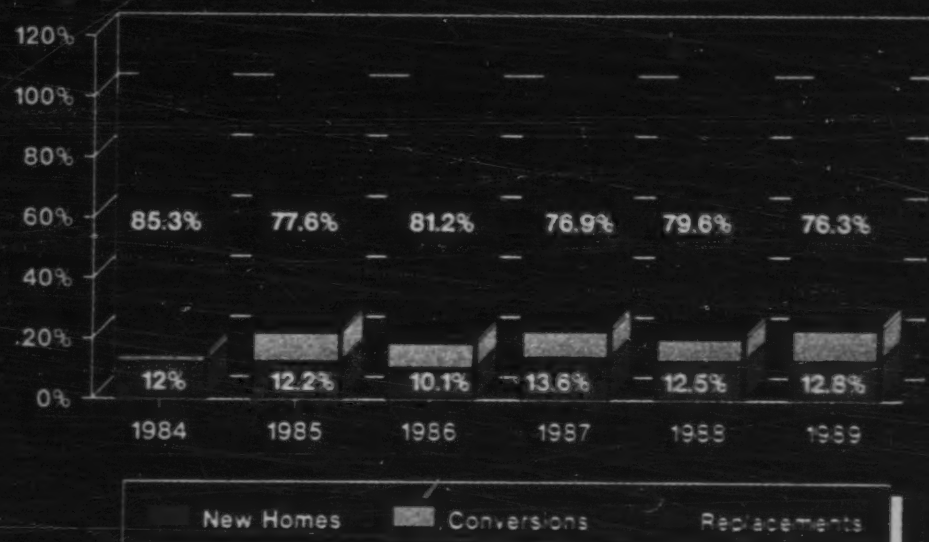
Circle 21

Circle 13

REPLACEMENT MARKET

OIL FURNACES

New homes, replacements



The News: Statistical Panorama 1990

new construction. The other two-thirds are service- and retrofit-related. Most of the retrofit activity is in small buildings. And, of the total nonresidential business, 45% is outside the U.S.

Chenoweth said Honeywell has nearly a one-third share of the \$4.3 billion global building environmental controls market. He estimated that home remodeling expenditures will increase by 30%, in real terms, by the year 2000. Controls for homes represent about 25% of total Homes and Buildings sales and, of that, 35% to 40% is outside the U.S.

Air conditioning

For easier understanding and better accuracy, the replacement market for unitary air condition-

(Page 52, Please)

HOME CENTRAL AIR

Replacements and add-ons



The News: Statistical Panorama 1990

the 1987 total of \$6.41 billion.

Of the 1988 heating and air conditioning total, maintenance and repairs accounted for \$2.751 billion, or 36.9%; additions and alterations accounted for \$1.367 billion, or 18.3%; and major replacements for \$3.352 billion, or 44.9%. Also, \$5.134 billion (or 68.8% of the total) was spent on owner-occupied homes and \$2.236 billion (or 31.2% of the total) was spent on rental properties.

Major replacements include furnaces, boilers, central air conditioners, and heat pumps. Regionally, total expenditures of \$4,838 billion in 1988 for heating and air conditioning alterations to owner-occupied single-family homes broke down this way: Northeast 30.9%; Midwest 30.8%; South 27.5%; and West 10.7%.

Contractors still tops

Contractors are doing almost all of the heating and air conditioning work. In 1988, contractors did 93.8% of all jobs and, in only 0.5% of those jobs did the homeowner purchase equipment and materials. Only 5.7% of job value was handled by do-it-yourselfers.

There are many reasons for the surge in home renovations. The most obvious is that the nation's 100 million housing units (60 million single-family, 33 million multi-family, 6 million mobile homes) are aging. About 33% were built before 1950 and are more than 40 years old. Only 36% of the housing stock was built since 1970.

Affordability problems, particularly in the Northeast and parts of the West, are forcing many to buy existing rather than new homes. And with the purchase comes the urge to add missing amenities, usually within five years of the purchase.

Nonresidential market

According to a Department of Energy survey, there are 4,154,000 nonresidential buildings in the U.S. with 58.2 billion square feet of floor space. NAHB estimates that total remodeling expenditures for these nonresidential buildings are roughly estimated to be slightly more than for residential buildings, or about \$100 billion in 1987. Almost all of the work is done by professionals.

In his presentation to security analysts last November, Joe E. Chenoweth, president of Honeywell Home and Building Automation and Control, said only one-third of Honeywell's nonresidential buildings business is tied to

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Circle 6

REPLACEMENT MARKET

(Continued from Page 49)

ing should be separated into four parts: residential and commercial comfort cooling and residential and commercial heat pumps.

If we subtract 835,424 heat pumps from the 1989 unitary total of 4,324,437 units, we get 3,489,013 comfort cooling units, of

which 85% or 2,965,661 were residential and 15% or 523,350 were commercial units.

The split was selected because it matched the latest determination of the Air-Conditioning and Refrigeration Institute (ARI). If you're comparing this split with the one found in the *Air condi-*

tioning section, remember that this one does not include heat pumps.

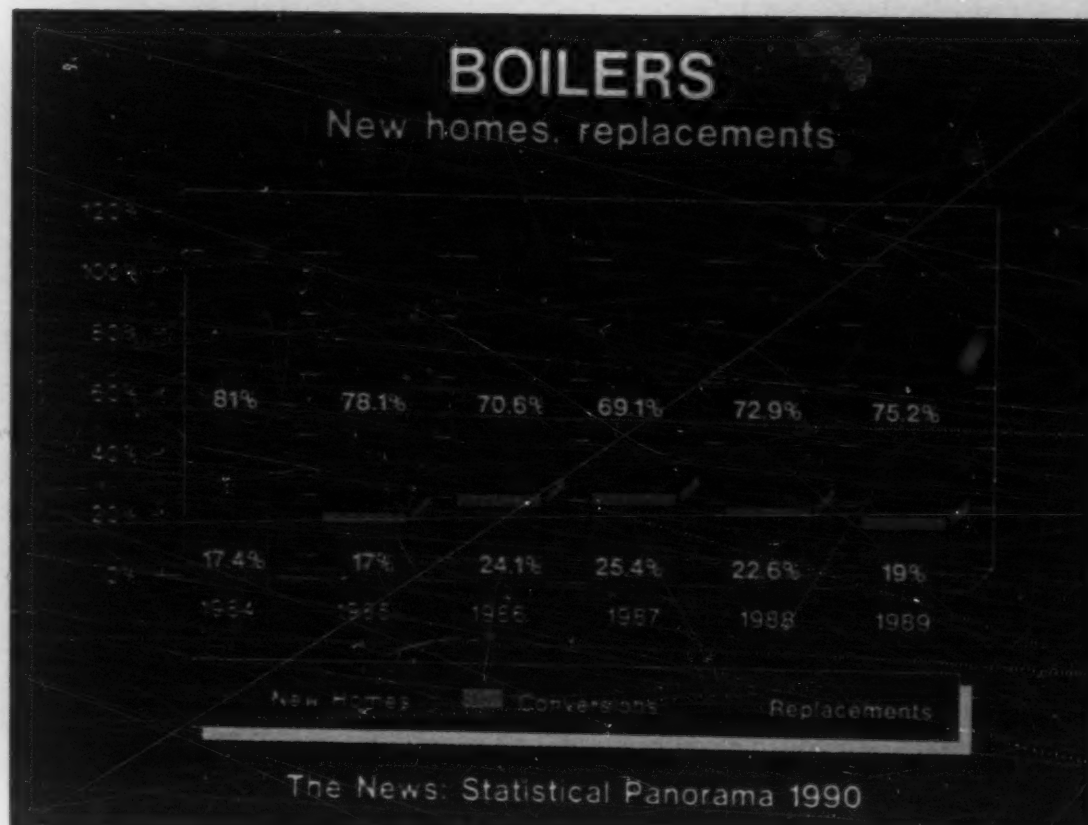
Of the 2,965,661 residential cooling units shipped in 1989, we estimate that 892,000 went into new construction (676,100 into single-family homes and 216,200 into multi-family units). These figures are arrived at by multiplying the penetration rate for central air conditioners (less the heat pump penetration rate) by the known number of housing starts.

The new single-family air conditioning and heat pump totals were increased by 20% in 1988, and by 25% in 1989, to reflect the extra units going into larger homes to accomplish zoning. And, of that portion, we estimate that 2.4 units went into each home.

These figures reflect both the heavy trade-up emphasis in today's single-family market and the increasing median size of new homes, which now exceeds 1,800 sq ft. We should warn, however, that the extra-unit allowance will likely decline in future years as construction in the South expands.

Looking back at the air conditioners used in new homes last year, we find a 4.7% decline from the 936,100-unit total for 1988. Similarly, units used in mobile homes last year, at 69,300, were down 9.3% from the 76,400 air conditioners installed in new mobile homes in 1988.

Replacement residential central air conditioners in 1989 totaled 1,558,700 units, a 24% increase over the estimated 1,260,010 replacement units in 1988. That represents 52.5% of the central residential cooling market in



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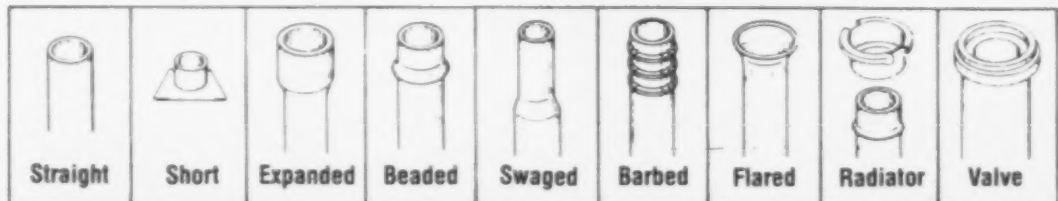
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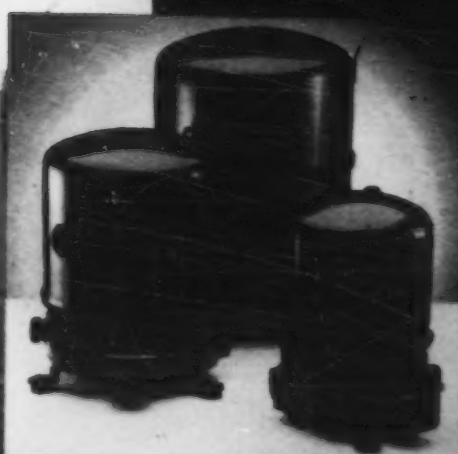
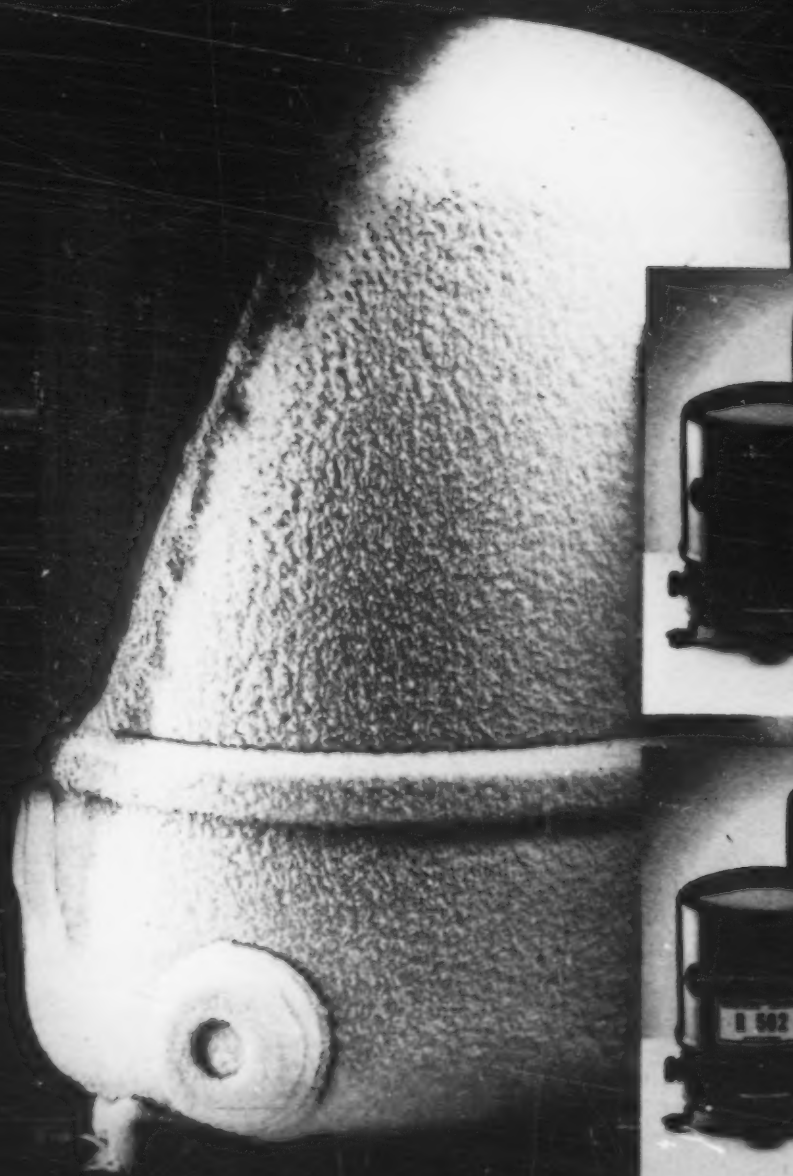
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Circle 20

1989, up from 46.1% a year earlier. There has been a steady upward progression from 36% in 1984. If our projections hold true, the replacement percentage should reach 55% in 1990.

Add-on or modernization units for homes not previously cooled with a central system enjoyed the lion's share of the market in the 1960s and early 1970s. The percentage dropped to about 12% early in the 1980s. But hot summers in 1987 and 1988, plus utility efficiency incentives, have increased the add-on share to 15% in each of the past two years. Moderate interest rates should help keep add-on sales at that level.

We estimate that 445,000 units were add-ons in 1989, up 8.5% from the 409,900 add-on units shipped in the previous year. The total should increase only marginally in 1990 to 450,000 units.

It must be remembered that central air conditioners have been installed in more than 30 million U.S. homes. Of these, more than 2.2 million each year cross into the 12-to-15-year-old prime replacement category. When major service problems arise, many contractors urge replacement of 8-year-old or younger units for reasons of efficiency.

Commercial

Of the 523,350 commercial unitary comfort cooling units shipped last year (up 8.5% from the 482,200-unit total for 1988), we estimate that 45% — or 235,550 units — were replacements. The remaining 287,800 units went into new construction.

As late as 1985, we estimated that 70% of commercial unitary air conditioners went into new construction. But, although there are no firm benchmarks, we estimate that the replacement segment has been growing steadily.

Heat pumps

Of the 835,424 air-to-air heat pumps shipped last year, we estimate that 710,100 (15%) were residential units. Of these, 434,900 (61.2%) went into new site-built homes (338,000 in single-family and 96,900 in multi-family homes), and 26,000 units were installed in mobile homes.

Heat pump replacements and add-ons, at 249,500 units in 1989, represented 35% of the residential market, or virtually the same proportion as in 1988.

The decline of the housing market in the South, the prime mar-

ket for heat pumps, has been costly. This, together with housing start declines in each of the past three years, has added to the problem. A considerable inventory overhang in 1990 shouldn't hurt our projected increase to 262,400 residential heat pump replacements in 1990, but it does promise much more competitive unit prices.

Contractors, particularly in the South, have been concentrating on replacement sales when new construction — still the prime market for heat pumps — has been slow. The replacement drive has been helped by the sharp increase in heat pump efficiencies and the fact that nearly half a million heat pumps arrive at prime replacement age each year.

Furnaces

Of the 2,162,185 residential gas furnaces shipped in 1989, we estimate that 735,000 (34%) went into new single- and multi-family homes, 20,000 were conversions from other fuels, and 1,407,185 gas furnaces (65%) were replacement units.

That represents a 7.5% increase over the 1,308,965 replacement gas furnaces shipped in 1988, and was the main contributor to the small increase in gas furnace shipments last year. And, again in 1990, replacements should keep gas furnace shipments even, despite another drop in housing starts.

In addition to the replacements among the more than 10 million gas furnaces at least 15 years old, a new efficiency market has grown up in recent years. Homeowners are replacing furnaces in good working order to take advantage of the substantial increases in efficiency available with today's units. We suspect this trend has flattened in the last two years, but promises to increase in future years as gas prices escalate.

Of the 178,980 residential oil furnaces shipped last year, we estimate that 23,000 (12.8%) went into new single- and multi-family homes, and 19,500 (10.9%) were conversions from other fuels. This means that 136,500 oil furnaces, or 76.3% of the total, were replacements.

The performance of oil furnace replacements last year represented a 16% drop from the 1988 replacement total of 162,300 oil furnaces. The prime reason was the decline in housing activity in

(Next Page, Please)

BEST AVAILABLE COPY

Bureau of the Census data

A 10-year look at air conditioning and refrigeration unit shipments

Product	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Ammonia compressors	2,014	1,860	1,808	1,509	1,173	1,233	1,140	1,252	1,886	2,132
Screw compressors ¹	—	5,809	5,320	2,620	3,601	—	—	—	—	—
Central-station air handlers	60,266	60,841	59,866	58,961	56,301	53,413	59,008	61,363	59,359	70,353
Unitary air conditioners ⁴	3,057,009	1,881,465	1,991,507	1,568,838	2,067,152	2,448,677	3,419,063	3,668,380	3,047,919	3,331,928
Packaged terminal air conditioners	183,274	143,212	143,427	135,741	150,073	184,780	119,123	145,591	135,214	65,528
Packaged terminal heat pumps ¹	—	—	32,439	52,512	58,753	93,549	96,155	105,984	98,312	55,251
Reciprocating chillers	9,695	12,325	12,090	11,668	10,533	13,788	14,064	12,604	13,242	15,523
Absorption chillers ⁶	392	279	239	199	135	153	131	—	1,411	1,670
Evaporative condensers	3,263	2,881	2,859	2,166	2,149	2,426	2,505	2,282	2,382	2,182
Mobile vehicle air conditioners	7,651,198	5,852,328	6,059,342	5,651,329	9,267,612	12,196,385	13,008,516	—	9,752,154	12,174,250
Recreational vehicle air conditioners ¹	—	93,919	119,566	142,227	156,689	173,914	172,833	177,842	—	—
Unit coolers ⁷	187,434	175,371	169,487	163,697	187,612	179,726	205,282	186,301	200,296	205,558
Dehumidifiers	728,148	734,738	540,386	438,833	610,013	586,003	589,056	484,981	580,399	—
Humidifiers (central and self-contained) ¹	—	423,986	396,413	310,342	324,948	427,504	370,585	410,762	454,295	493,897

Source: Bureau of the Census Current Industrial Reports MA-35M, Air-Conditioning and Refrigeration Equipment, including Warm Air Furnaces. ¹New category since 1980. ²Includes vertical stack units. ³Withheld to avoid disclosing operations of individual companies. ⁴For years 1980 through 1984, add these figures to those for unitary heat pumps (air-to-air) and subtract exports to get comparable industry figures. ⁵Ex-

cludes open-type units. Also excludes units 200 hp and under and units 401 to 500 hp. ⁶Excludes railway freight cars. ⁷Excludes floor-mounted dry and spray types for 1979 and succeeding years. ⁸Grouped with adsorption, open-type absorption, in 1986.

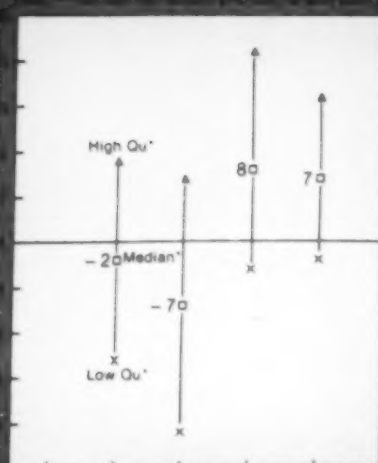
WHOLESALESALES

NHAW regional forecasts

REGIONALITY was again prevalent in these forecasts supplied by the North American Heating and Airconditioning Wholesalers Association (NHAW). They depict the expectations of the upper quartile, lower quartile, and median of all reporting wholesalers in that region.

North America (all regions) forecast. (When compared to identical quarter in previous year — first quarter to first quarter; second quarter to second; etc.)

NORTH AMERICA (All Regions) FORECAST



Reminders of Previous Performance: (Most recently completed quarters as compared to a year earlier)

Medians

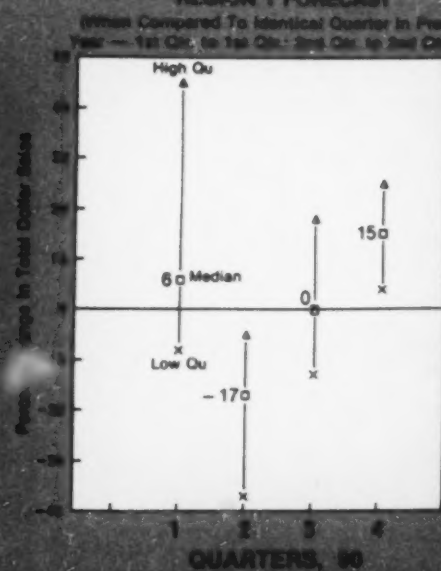
4th qtr '89 — ahead 2%

3rd qtr '89 — even 0%

2nd qtr '89 — ahead 12%

1st qtr '89 — ahead 11%

REGION 1 FORECAST



Reminders of Previous Performance: (Most recently completed quarters as compared to a year earlier)

Medians

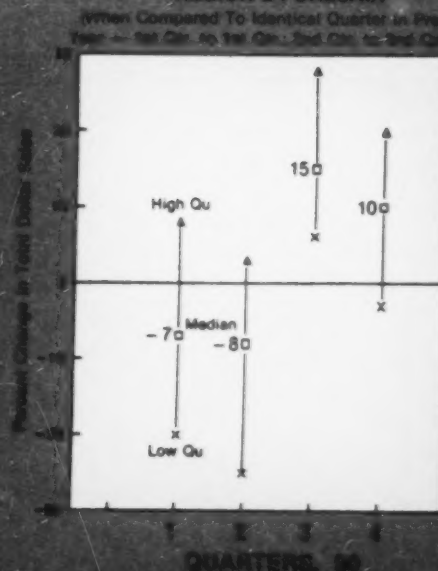
4th qtr '89 — was off -4%

3rd qtr '89 — ahead 3%

2nd qtr '89 — ahead 24%

1st qtr '89 — ahead 18%

REGION 2 FORECAST



Reminders of Previous Performance: (Most recently completed quarters as compared to a year earlier)

Medians

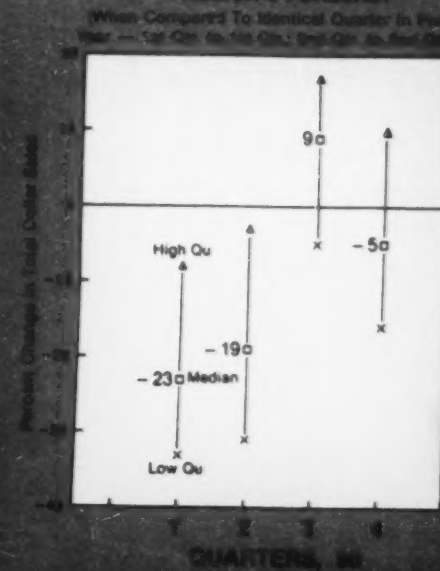
4th qtr '89 — was off -4%

3rd qtr '89 — was off -9%

2nd qtr '89 — ahead 18%

1st qtr '89 — ahead 14%

REGION 3 FORECAST



Reminders of Previous Performance: (Most recently completed quarters as compared to a year earlier)

Medians

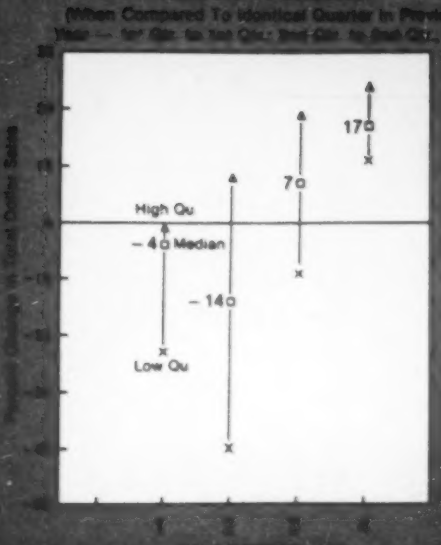
4th qtr '89 — was off -1%

3rd qtr '89 — was off -1%

2nd qtr '89 — ahead 11%

1st qtr '89 — ahead 11%

REGION 4 FORECAST



Reminders of Previous Performance: (Most recently completed quarters as compared to a year earlier)

Medians

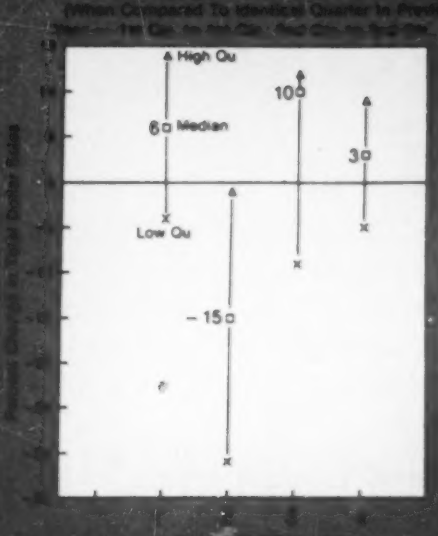
4th qtr '89 — was off -2%

3rd qtr '89 — was off -3%

2nd qtr '89 — ahead 18%

1st qtr '89 — ahead 19%

REGION 5 FORECAST



Reminders of Previous Performance: (Most recently completed quarters as compared to a year earlier)

Medians

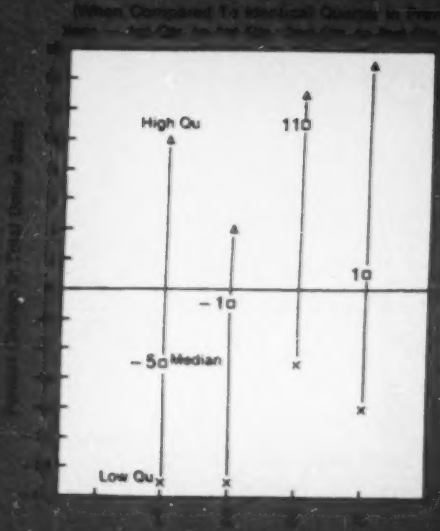
4th qtr '89 — ahead 7%

3rd qtr '89 — ahead 4%

2nd qtr '89 — ahead 15%

1st qtr '89 — ahead 15%

REGION 6 FORECAST



Reminders of Previous Performance: (Most recently completed quarters as compared to a year earlier)

Medians

4th qtr '89 — ahead 5%

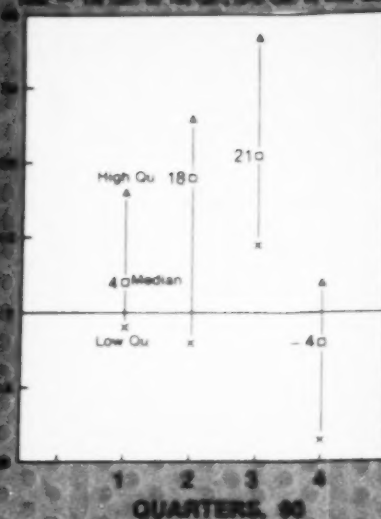
3rd qtr '89 — ahead 7%

2nd qtr '89 — ahead 3%

1st qtr '89 — ahead 1%

WHOLESALESALES

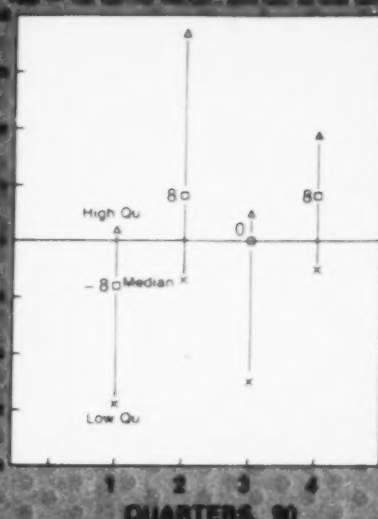
REGION 1 FORECAST
(When Compared To Identical Quarter In Previous Year — 1st Qtr. to 1st Qtr.; 2nd Qtr. to 2nd Qtr., etc.)



Reminders of Previous Performance:
(Most recently completed quarters as compared to a year earlier)

Medians
4th qtr 89 — ahead 1%
3rd qtr 89 — was off -1%
2nd qtr 89 — was off -1%
1st qtr 89 — was off -4%

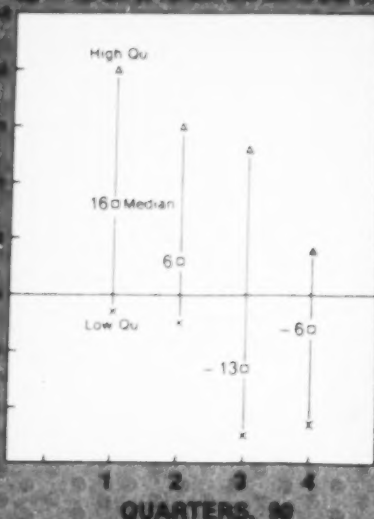
REGION 2 FORECAST
(When Compared To Identical Quarter In Previous Year — 1st Qtr. to 1st Qtr.; 2nd Qtr. to 2nd Qtr., etc.)



Reminders of Previous Performance:
(Most recently completed quarters as compared to a year earlier)

Medians
4th qtr 89 — ahead 12%
3rd qtr 89 — ahead 11%
2nd qtr 89 — ahead 5%
1st qtr 89 — ahead 11%

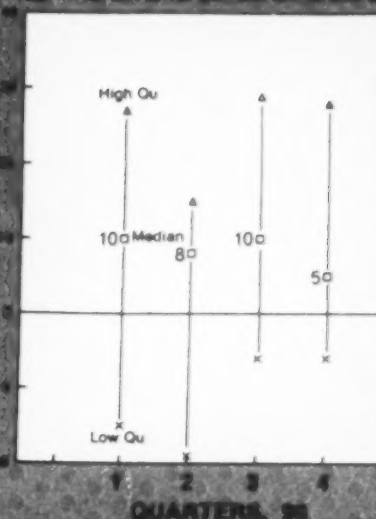
REGION 3 FORECAST
(When Compared To Identical Quarter In Previous Year — 1st Qtr. to 1st Qtr.; 2nd Qtr. to 2nd Qtr., etc.)



Reminders of Previous Performance:
(Most recently completed quarters as compared to a year earlier)

Medians
4th qtr 89 — ahead 7%
3rd qtr 89 — ahead 10%
2nd qtr 89 — ahead 10%
1st qtr 89 — ahead 11%

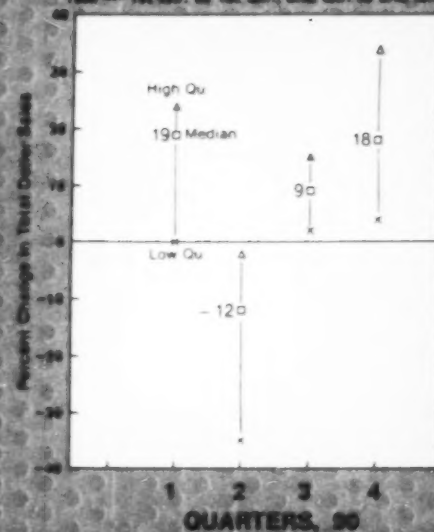
REGION 4 FORECAST
(When Compared To Identical Quarter In Previous Year — 1st Qtr. to 1st Qtr.; 2nd Qtr. to 2nd Qtr., etc.)



Reminders of Previous Performance:
(Most recently completed quarters as compared to a year earlier)

Medians
4th qtr 89 — ahead 9%
3rd qtr 89 — ahead 15%
2nd qtr 89 — ahead 30%
1st qtr 89 — ahead 19%

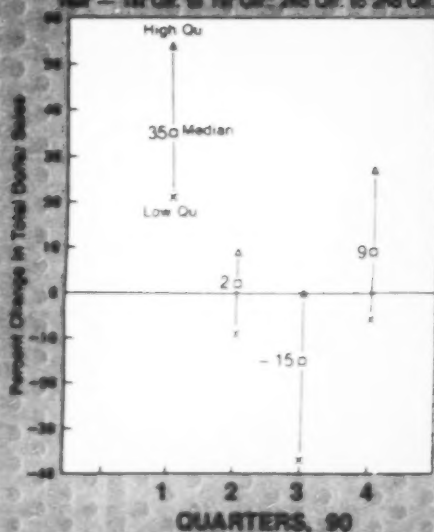
REGION 11 FORECAST
(When Compared To Identical Quarter In Previous Year — 1st Qtr. to 1st Qtr.; 2nd Qtr. to 2nd Qtr., etc.)



Reminders of Previous Performance:
(Most recently completed quarters as compared to a year earlier)

Medians
4th qtr 89 — ahead 3%
3rd qtr 89 — ahead 10%
2nd qtr 89 — ahead 31%
1st qtr 89 — ahead 21%

REGION 12 FORECAST
(When Compared To Identical Quarter In Previous Year — 1st Qtr. to 1st Qtr.; 2nd Qtr. to 2nd Qtr., etc.)



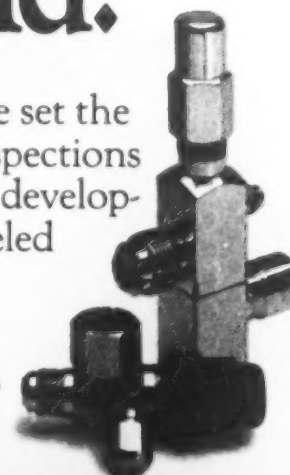
Reminders of Previous Performance:
(Most recently completed quarters as compared to a year earlier)

Medians
4th qtr 89 — was off -1%
3rd qtr 89 — ahead 6%
2nd qtr 89 — ahead 3%
1st qtr 89 — was off -2%

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PRIMORE VALVES

(Continued from Page 53)

and Utah) at 6.3%.

Lesser median increases in 1989 sales included a 5.7% increase in Region 6 (Minnesota, Iowa, Nebraska, Montana, Kansas, North and South Dakota); a 3.77% increase in Region 4 (Ohio and Michigan); a 2.41% increase in Region 3 (Delaware, Maryland, West Virginia, Virginia, North Carolina, Kentucky, Tennessee, and D.C.); and a 2% increase in Region 2 (New York, New Jersey, and Pennsylvania).

Canadian NHAW members posted a 10% median increase in 1989 sales over their experience in the previous year. The average increase was 12.42%. There was insufficient data for Regions 8 and 12.

In terms of firm size, companies with annual sales volumes of \$10 million to \$15 million registered a median sales increase of 9.7% in 1989 over 1988. They were followed by a median increase of 8.2% for firms with sales volumes of from \$6 million to \$7.5 million.

The poorest performance, a median increase of only 0.14% in 1989, was registered by firms with annual sales volumes of \$15 million to \$20 million. Both the largest firms (annual sales of \$20 million or more) with a 4.41 median sales increase, and the smallest firms (annual sales of \$2 million or less) with a median increase of 7.46%, did well.

1990 forecast

Looking ahead, NHAW provides a quarter-by-quarter comparison of total sales — nationally and by region — compared with the identical quarter in the previous year. No longer does it provide forecasts according to product groupings.

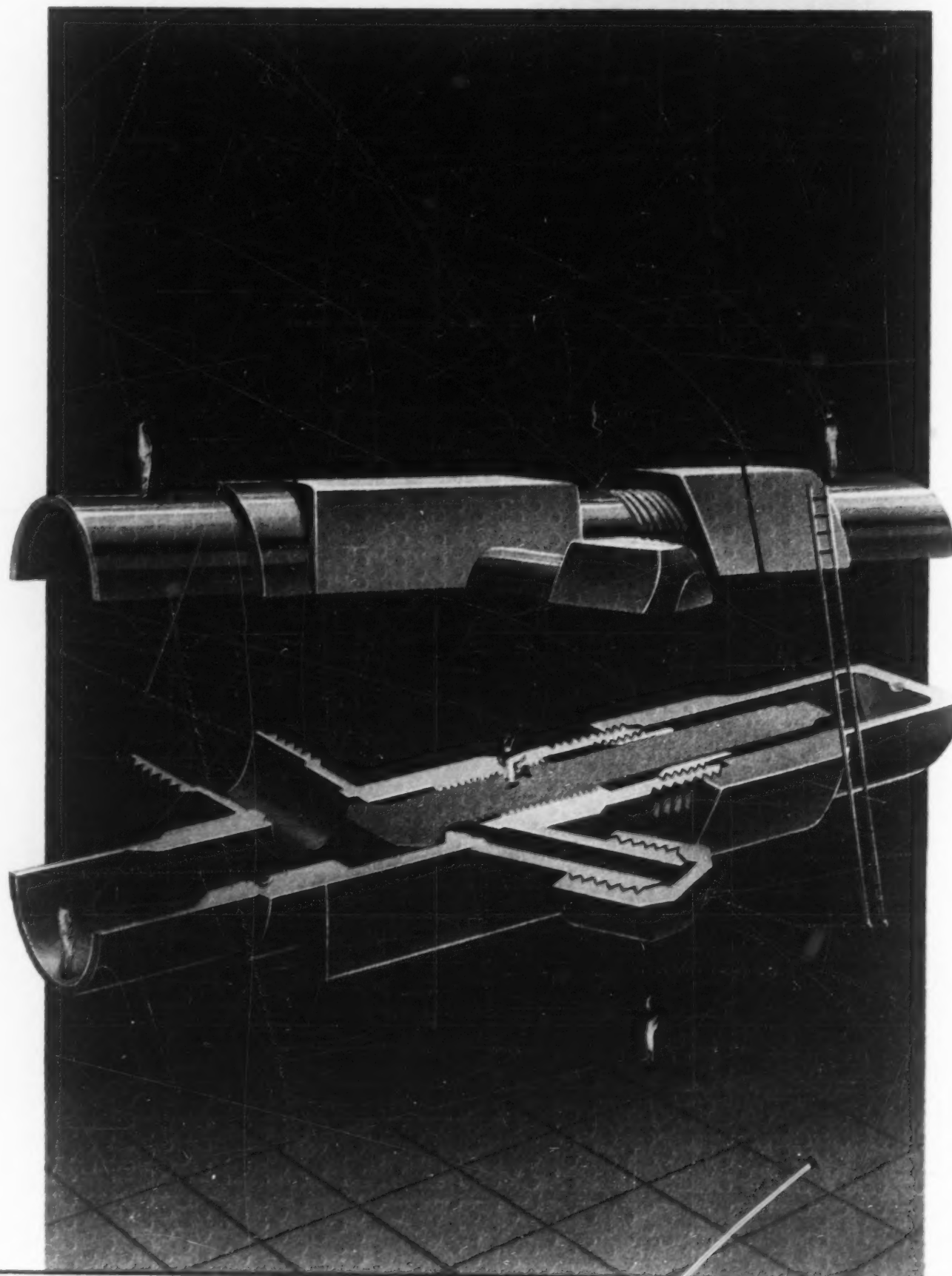
As can be seen in the accompanying charts, the North American outlook is for a median decline of 2% in the first quarter of 1990, a 7% decline in the second quarter, and 8% and 7% increases in the last two quarters of the year. It should also be noted that performance in the third quarter of 1989 was flat and was followed by only a 2% increase.

In a broad sense, then, NHAW members expect little growth this year. The 1990 expected increase of 1.5% compares with a 6% sales change in 1989 and double-digit sales increases in each of the two preceding years.

The forecast was prepared for NHAW by William A. Spooner Associates, Columbus, Ohio. It relates data supplied by NHAW members with econometric models maintained at the University of California at Los Angeles (UCLA), which develops a forecast for the nation based on the DRI econometric model.

The base UCLA forecast calls for a slowdown in the growth of the gross national product (GNP) in 1990. The risk of recession has less-

(Next Page, Please)



Circle 24

Nonresidential markets slow but some bright spots remain

Although expenditures for non-residential construction in 1989, at \$93 billion, were up 3% from the \$90.6 billion a year earlier, the real measure of activity — square feet — was down 4% last year, according to F.W. Dodge Division of McGraw-Hill, Inc.

The recovery in industrial construction, which began in 1988, continued last year with a 9.7% gain as U.S. industry attempted to

regain its competitive position in global manufacturing. Permit activity indicates this market will hold even in 1990.

A substantial part of the industrial buildup reflected activity in such old-line industrial cities as Philadelphia, Newark, Detroit, Chicago, and Minneapolis. But Los Angeles, San Diego, San Jose, and Oakland accounted for a quarter of industrial construction last

year and reflected more export-oriented manufacturing.

Office buildings, plagued by high vacancy rates, did surprisingly well in 1989. The decline was only 3.1% in real terms, despite a general cooling off in the Northeast and such metropolitan markets as Washington, D.C., Atlanta, Nashville, and Richmond. There are strong markets in Chicago, San Diego, Sacramento, and Portland.

A rapid growth in office jobs, including financial and information services, explains much of this strength. Nationally, the overall office vacancy rate declined from 17.2% at the end of 1988 to 16.4% at the end of last year. The downtown vacancy rate, at 13.7%, held

even last year while the suburban vacancy rate dropped from 21.6% in 1988 to 19.1% last year.

According to the Building Owners and Managers Association (BOMA) International, the flight from downtown is being aided by higher quality buildings in the suburbs and an increasing differential between downtown and suburban rental rates.

The hotel and motel construction market continues to attract foreign and domestic capital. Construction activity was up 10.4% in real terms last year, although concerns about rising vacancy rates promise a slowdown in 1990. Institutional construction showed a 2.7% increase in 1989 after strong years in 1987 and 1988, but per-

mit activity indicates as much as a 13% drop this year.

Other commercial construction, reflecting a sagging housing market over the past three years, declined by 3.5% in 1989, and permit activity indicates another 12% drop in retail store construction in 1990. New retail centers account for about half of this category.

According to the National Association of Home Builders (NAHB), the top 10 nonresidential building markets in 1989 were, in order: Los Angeles-Long Beach; Washington, D.C.; Chicago; Riverside-San Bernadino; Atlanta; Anaheim-Santa Ana; San Diego; Detroit; Philadelphia; and Phoenix.

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WHOLESALE

(Continued from Preceding Page)
sened, the economists say, because there is no inflationary momentum to be curbed.

All wholesalers

Despite 1989 fourth-quarter increases in net sales and income

Each Statistical Panorama includes the latest data available. Sources frequently revise their previous year's figures, which explains apparent discrepancies between the latest and earlier published data. Where sources give significantly varying information, that data is mentioned.

over a year earlier, the nation's \$1.6 trillion wholesale distribution industry views the first quarter of 1990 with caution, according to the National Association of Wholesaler-Distributors (NAW).

The confidence survey index, initiated by NAW in the fourth quarter of 1989 at a level of 100, declined to 98.3 for this year's first quarter. The survey was conducted in early January by the accounting firm Arthur Anderson & Co.

The decline in overall confidence is mirrored by expected capital expenditures, according to NAW's Ron Schreiber. Even though expenditures are expected to be 3%

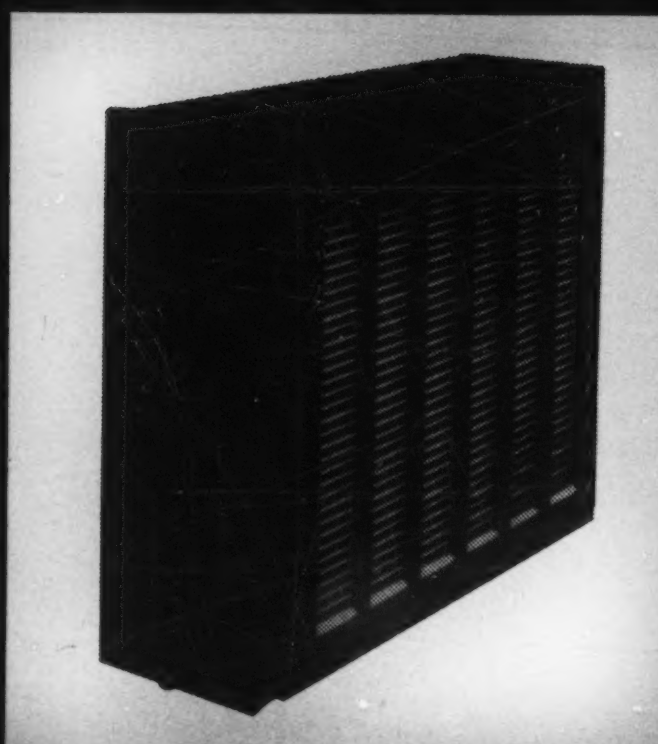
higher in the first quarter of 1990 over the same period a year ago, that increase is only half the 6% increase recorded in the last quarter of 1989.

"Although the participants believe first-quarter 1990 sales and orders will be higher than in the first quarter of 1989, the rate of increase is slowing," said NAW president Dirk Van Dongen.

Added the accounting firm's Pat Dolan, "The survey reveals only minimal increases in gross margins from 1988 to 1989. The pressure on gross margin continues to have an impact on the industry as it looks for creative ways to compete while continuing to reduce costs."

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FUELS AND ENERGY

United States energy consumption for the first 10 months of 1989 was 66.647 quadrillion Btu (quads), an increase of 0.6% over the 66.258 quads consumed during the same period of 1988, according to the Energy Information Administration (EIA).

To add some perspective, the nation's energy consumption for the full year 1988, at 80.087 quads, was 7.8% higher than the 74.282 quads consumed in 1973, the year of the OPEC oil embargo. The 1988 total, however, did eclipse the previous yearly record total of 78.898 quads set in 1979, just after the second major oil price shock.

In the residential-commercial sector (EIA lumps them together), the 23.971 quads consumed during the first 10 months of 1989 was 5% more than 22.818 quads consumed by this sector during the same period in 1988. The 1988 full-year total of 28.944 quads represented a 19.9% increase over the 24.143 quads used by the residential-commercial sector in 1973.

During the first 10 months of 1989, this sector represented a 36% share of total energy consumption, almost the same as for 1988 but up considerably from the 32.5% share for this section in 1973.

Industrial sector consumption of 24.482 quads during the first 10 months of 1989 was up 1.5% over the 24.116 quads consumed by this

sector during the same period of 1988. The full-year 1988 total of 29.099 quads was 7.7% less than the 31.527 quads consumed by this sector in 1973.

During the first 10 months of 1989, the industrial sector represented a 36.7% share of total energy consumption, almost the same as the same period in 1988. In 1973, the industrial sector consumed 42.4% of the nation's energy.

For the record, the transportation sector consumed 18.202 quads during the first 10 months of 1989, a 0.8% decline from the 18.34 quads consumed by this sector during the same period in 1988. It represented a 27.3% share of total energy consumption for the 1989 period, about the same as a year earlier. The share in 1973 was 25%.

Electric utilities consumed 24.219 quads of energy during the first 10 months of 1989, an increase of 1.4% over the 23.095 quads consumed by this sector during the same period in 1988. The 1988 full-year total of 28.532 quads was 43.7% more than the 19.852 quads consumed by electric utilities in 1973.

Of the 23.971 quads consumed by the residential-commercial sector during the first 10 months of 1989 (with the share for the same period in 1988 in parentheses), only 0.48% (0.55%) was coal; 24.8% (24.8%) was natural gas;

FUELS AND ENERGY

8.9% (9.1%) was petroleum; 20.4% (20.1%) was electricity; and 45.5% (45.4%) was electrical system generation and transmission losses.

Similarly, the 24,116 quads used by the industrial sector during the same period broke down this way: 9.6% (9.7%) was coal; 27.6% (26.3%) was natural gas; 28.3% (29.4%) was petroleum; 10.6% (10.6%) was electricity; and 23.7% (23.8%) was electricity generation and transmission losses.

Conservation

In order to get a gross measure of conservation, the Department of Energy records show that, in 1973, it took 27,100 Btu to generate each 1982 constant dollar of GNP (gross national product).

In the third quarter of 1989, it took 19,300 Btu to generate a 1982 constant dollar of GNP, or 28.8% less than in 1973. The 1989 figure was virtually identical to that recorded at the same time a year earlier.

In simpler terms, the U.S. economy in the third quarter of 1989 produced at a rate of 4.163 trillion constant 1982 dollars' worth of goods and services, with 28.8% greater energy efficiency than in 1973. Had it not been for that energy efficiency improvement, U.S. energy consumption in the third quarter of 1989 would have been at a rate of 103.36 quads instead of the actual 80.248 quads.

Fuel costs

The average residential price of No. 2 fuel oil in October, 1989, was 85.6 cents/gal, up 13.4% from the 75.5 cents/gal charged in October, 1988. The 1989 price was 28.3% less than the \$1.19/gal charged in 1981. The cost of No. 2 fuel oil in 1978, just before the second oil price shock, was 49 cents/gal.

In October, 1989, the average price of natural gas to homes was \$6.09/1,000 cu ft, an increase of 2.4% over the \$5.95/1,000 cu ft paid in the same month a year earlier. Gas prices have increased in 1988 and 1989 after declines in 1986 and 1987, but still are 0.5% less than the high of \$6.21/1,000 cu ft charged in 1984 and 1985. The 1989 average was 372% higher than the \$1.29/1,000 cu ft charged in 1973.

The average natural gas price charged commercial customers in October, 1989, was \$4.65/1,000 cu ft, up 2.9% from the \$4.52 charged in the same month a year earlier. It was 16.8% lower than the peak price of \$5.59/1,000 cu ft charged in 1983, but 394.7% higher than the 1973 price of 94 cents/1,000 cu ft.

The average price charged industrial customers in October, 1989, was \$2.72/1,000 cu ft, down 2.9% from the \$2.80/1,000 cu ft charged for natural gas in the same month of 1988. The 1989 price was 35.5% lower than the peak price of \$4.22/1,000 cu ft charged in 1984, but 444% higher than the 50 cents/1,000 cu ft charged in 1973.

The average price charged residential customers by privately owned electric utilities in October, 1989, was 8.02 cents/kWh, up a hair from the 8 cents/kWh charged in the same month of 1988. The increase came after previous highs of 7.79 cents/kWh in 1985 and 1986 and is 215.8% higher than the 2.54 cents/kWh charged

residential customers in 1973.

The average price electric utilities charged commercial customers in October, 1989, was 7.36 cents/kWh, down 0.8% from the 7.42 cents/kWh charged in October, 1988. The 1989 price represents a decline of 1.5% from the 7.4 cents/kWh charged in the peak year of 1985, but was 205.4% higher than the 2.41 cents/kWh charged commercial customers in 1973.

Similarly, the average price charged industrial customers in October, 1989, was 4.89 cents/kWh, an increase of 4.3% over the 4.69 cents/kWh charged industrial customers in the same month of 1988. The 1989 price was 5.2% lower than the peak price of 5.16 cents/kWh charged in 1985 but 291.2% higher than the indus-

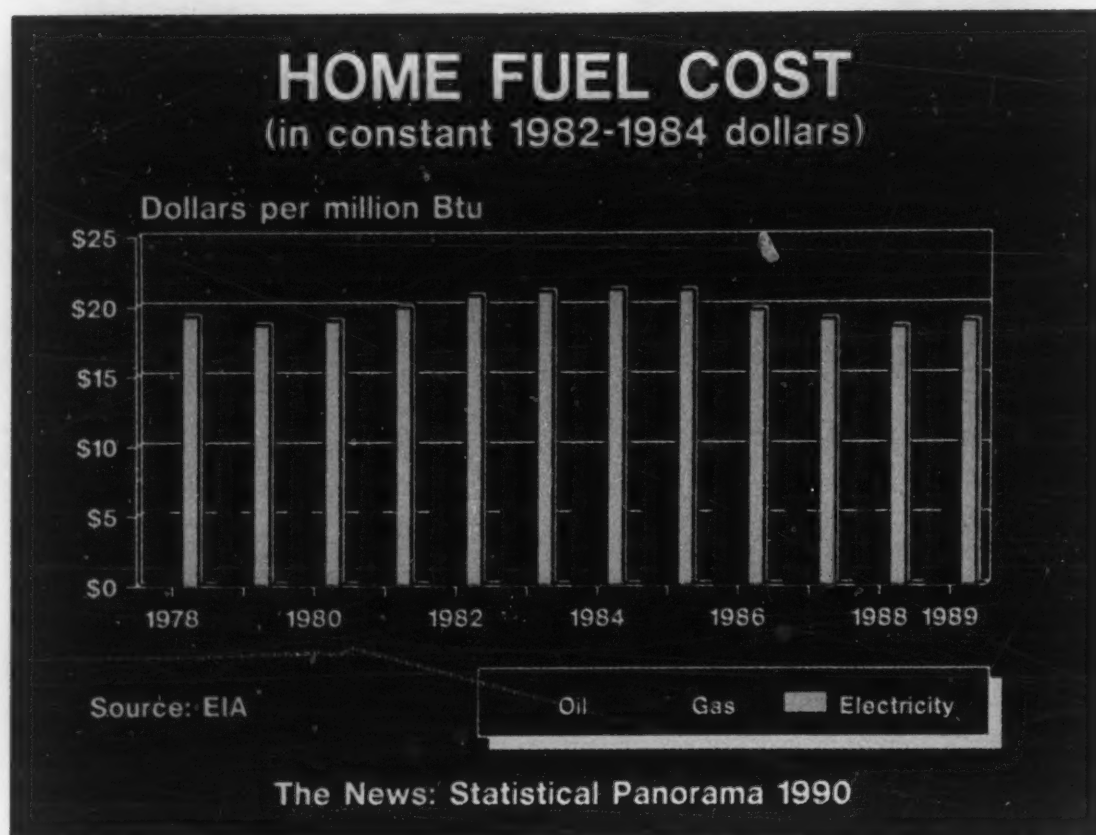
trial average rate of 1.25 cents/kWh charged in 1973.

Nuclear

In October, 1989, U.S. nuclear generating units produced a total of 43,588 million net kWh of electricity, an increase of 2% over the 42,591 million net kWh produced in the same month of 1988, according to EIA.

Also last October, nuclear units generated electricity at an average capacity factor of 59.7%, a decline of 1% from the capacity factor in the same month a year earlier. Nuclear power supplied 19.9% of the total electricity generated in October, 1989, down from 20.2% in October, 1988.

As of Oct. 31, 1989, there were 110 operable nuclear generating (Page 62, Please)



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FUELS AND ENERGY

(Continued from Page 57)
units in the United States with a collective net summer generating

capability of 97.9 million kW of electricity. Of the 110 units, 30 generated less than 25% of capac-

ity and 26 were out of service for maintenance or refuelling.

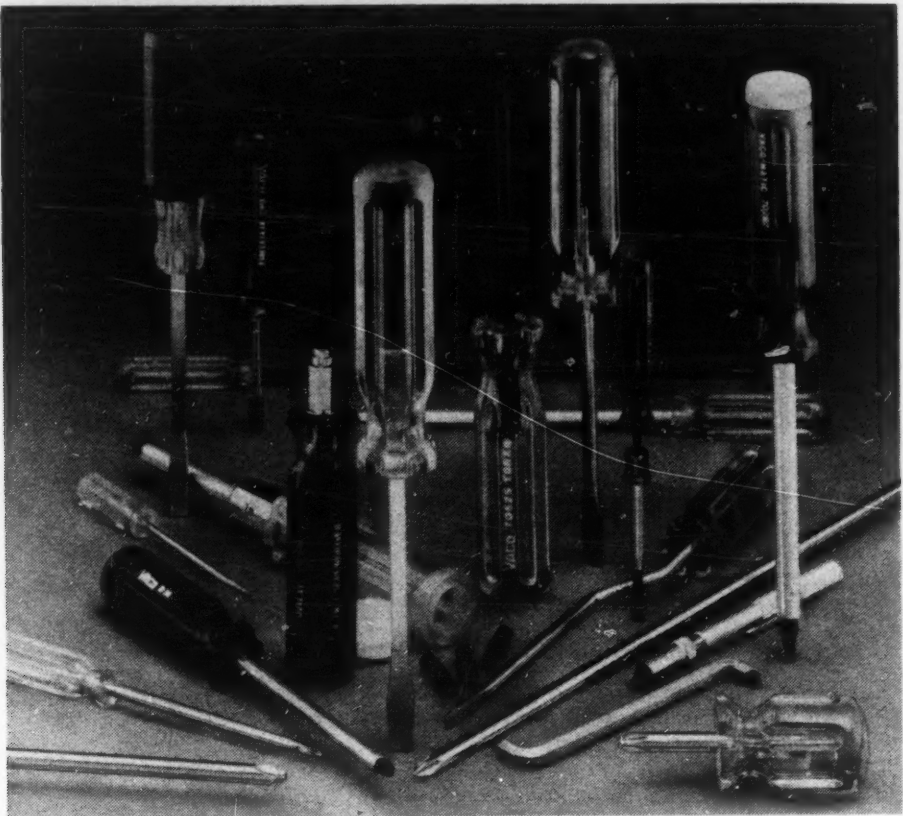
Total net electricity generation for the first 10 months of 1989, the latest period for which these EIA data are available, was 2,300,870 million kWh, an increase of 1.7% from the 2,261,905 million kWh total for the same period in 1988.

Electricity sales to ultimate customers, at 2,198,178 million kWh for the first 10 months of 1989, were up 2% from the 2,154,479 million kWh total for the same period a year earlier.

Of the 2,300,870 million kWh of electricity generated in the first 10 months of 1989 (with the comparable 1988 percentage in parentheses), 55.6% (56.7%) came from coal; 5.4% (5.1%) came from petroleum; 10% (10%) came from natural gas; 18.9% (19.6%) came from nuclear fuel; 9.6% (8.2%) came from hydroelectric plants; and 0.4% (0.4%) came from other sources.

Of the 2,198,178 million kWh of electricity sold in the first 10 months of 1989, residential sales (with a 34.3% share) amounted to 754,239 million kWh, up 0.4% from 751,385 million kWh sold in the same period a year earlier.

Commercial sales (with a 27.6% share) totaled 607,252 million kWh for the period, up 3.4% from 587,214 million kWh. And industrial sales (with a 34.6% share) totaled 761,089 million kWh for the 1989 period, up 1.9% from 747,105



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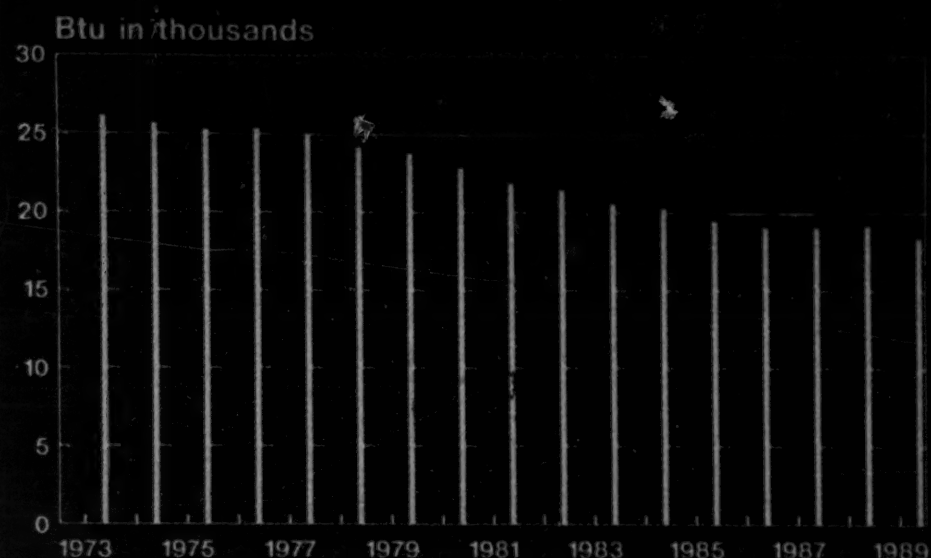
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U.S. ENERGY CONSUMPTION (per dollar of GNP)



The News: Statistical Panorama 1990

million kWh. Other sales (with a 3.4% share) totaled 75,597 million kWh in the 1989 period, up 9.9% from 68,775 million kWh in 1988.

The net summer generating capability of the electric utility industry at the end of the third quarter of 1989 was 681,586 MW (megawatts), up 0.9% from the same time a year earlier, according to the Edison Electric Institute (EEI). Similarly, the net winter generating capability at the end of the third quarter of 1989 was 692,791 MW, also up 0.9% from the same time in 1988.

EEI reported that weekly electric utility output for the contiguous 48 states for the 52 weeks ended Dec. 30, 1989, was 2,846,431 million kWh, a 2.6% increase over the same period a year earlier. The largest increase, at 4.5%, was in the Pacific Northwest, followed closely by 4% in the Rocky Mountain states and 3.7% in the Southeast. The smallest increase, at 0.6%, was in the West North Central region.

The average number of electric utility customers at the end of the third quarter of 1989 was 107,228,000, up 1.4% from the 105,750,000 total at the same time in 1988.

Five units with full-power licenses have been shut down for extended periods: Nine Mile Point 1 since December, 1987; Browns Ferry 1 and 3 since March, 1985; Browns Ferry 2 since September, 1984; and Three Mile Island since March, 1979. There are another 11 units in some stage of planning or construction.

Natural gas

Gas utility thermal equivalent sales in 1989 totaled 10,820 trillion Btu, an increase of 1.2% over the previous year's total of 10,690.7 trillion Btu, according to the American Gas Association (AGA). The total of 1989 represents a 14.2% drop from the 1985 total of 12,615 trillion Btu.

It should be noted that an additional 4,985.5 trillion Btu equivalent was recorded in 1989 for transportation, an increase of 18% over the 1988 transportation total of 4,224.7 trillion Btu. There was a similar increase in this sector in 1988 over 1987.

Much of the transportation increase is represented by direct sales by producers to large industrial, commercial, and electric utility customers that bypass local utilities. It's the principal strategy producers use to obtain these large dual-fuel customers in the face of

lower oil prices.

Residential sales (44.5% of the total) in 1989 amounted to 4,810.1 trillion Btu, an increase of 2.5% over the year-previous total of 4,691.8 trillion Btu. The residential sector had a 39.4% share in 1986.

Commercial sales (21.3% of the total) totaled 2,308.9 trillion Btu in 1989, an increase of 0.2% over the 1988 total of 2,303.5 trillion Btu.

Industrial sales (19.4% of the total) amounted to 2,094 trillion Btu in 1989, a decline of 5% from the 1988 total of 2,204.2 trillion Btu. The industrial sector's share of total sales was 26% in 1986.

Electricity generation sales (13.2% of the total) totaled 1,431.3 trillion Btu in 1989, an increase of 7.5% over the 1988 total of 1,331 trillion Btu. The "other" category (1.6% of the total) accounted for 175.7 trillion Btu last year, up 9.7% from the total of 160.2 trillion Btu in 1988.

AGA reported that the December, 1989, average natural gas utility prices, expressed in dollars/million Btu (and with December, 1988, prices in parentheses) were: all \$4.66 (\$4.58); residential \$5.18 (\$5.13); commercial \$4.84 (\$4.71); industrial \$3.17 (\$3.10); and electricity generation \$3.19 (\$3.32).

Exploration

Total exploration and development oil and gas well completions during the first 11 months of 1989 totaled 25,820 wells, a decline of 8.9% from the 28,340 oil and gas wells completed during the same period in 1988. Both years are dramatically lower than the 90,130 well completions in the peak year of 1981.

Oil well completions during the first 11 months of 1989 totaled 10,000, down 17.2% from the 12,080 oil wells completed during the same period a year earlier. Gas wells completed in the first 11 months of 1989, at 8,070, showed an increase of 11.5% over the 7,240 gas wells completed during the same period of 1988. The remainder were dry wells, which have averaged about 31% of all wells drilled for the last decade.

Total footage drilled during the first 11 months of 1989 amounted to 118.28 million feet, a 14.1% decline from the 134.96 million feet drilled during the same period a year earlier.

In 1989, the weekly average of rotary drilling rigs in operation was 869, a decrease of 7.2% from

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FUELS AND ENERGY

the 1988 average of 936 rigs. Of these, 88% were on land and 12% were offshore. The average number of crews involved in seismic exploration in 1989 was 132, down 27.5% from the average of 182 seismic crews a year earlier. Of the 1989 total, 82.5% were on land and 17.5% were in marine vessels.

Imports

United States net imports of energy for the first 10 months of 1989 amounted to 11.748 quads, an increase of 8% over the 10.869 quads of energy imported during the same period in 1988. This amounts to 17.6% of domestic consumption. Or, put another way, the U.S. produced 82.4% of all the energy it consumed during the first 10 months of last year.

Of the 11.748 quads of energy imported during the first 10 months of 1989, crude oil accounted for 10.125 quads, or 86.2%; petroleum products accounted for 2.521 quads, or 21.5%; natural gas accounted for 1.055 quads, or 9%; electricity accounted for 0.142 quads, or 1.2%; coal and coke accounted for 0.034 quads, or 0.3%; and, on the positive side, 2.13 quads of coal exports accounted for 18.1%.

Significantly, in the third quarter of 1989, the U.S. was importing petroleum at a rate of 16,785,000 barrels/day, or 44.4% of all petroleum products supplied to U.S. markets, down from the 17,083,000 million barrels/day rate in the third quarter of 1988,

but up from the 38.8% of all petroleum products supplied.

Of the 1989 third-quarter imports, 58.6% came from OPEC (Organization of Petroleum Exporting Countries) and 41.4% came from Arab OPEC countries.

In dollar terms, the \$8.92 billion in energy exports over the first 11 months of 1989, up 21% from \$7.37 billion in the same period of 1988, fell far short of the \$48.32 billion in energy imports for the period. Imports increased by 29%, from \$37.5 billion for the first 11 months of 1988 to \$48.3 billion for the same period last year.

The nation's negative energy trade balance, at \$39.4 billion through the first 11 months of 1989, increased by 31% over the \$30.08 billion negative trade balance for the same period in 1988.

The U.S. has had a negative energy trade balance every year since at least 1974. It reached a peak of \$74.9 billion in 1980 and dropped gradually to a post-1976 low of \$29.195 billion in 1986.

Coal

The U.S. coal industry produced a record 975 million tons of coal in 1989, a 2.6% increase over the previous record of 950 million tons set in 1988, according to the National Coal Association (NCA). It was the third consecutive record year for both production and consumption.

Production in 1990 is expected to increase by 2.3% to 997 million

tons, another record year. With the addition of 3 million tons from imports, it will make available 1 billion tons of bituminous, sub-bituminous, lignite, and anthracite coal to the U.S. market.

NCA's Economics Committee forecast that domestic consumption in 1989 totaled 888 million tons, a 0.6% increase over the 883 million tons consumed in the previous year.

Consumption by electric utilities — which accounted for 86% of the total last year — amounted to 763 million tons in 1989, up marginally from the year-previous total of 758 million tons. In 1990, coal demand by electric utilities is forecast to increase by 1.6% to 772 million tons. Coal's share of this market will drop slightly to 55.9% because of the continued comeback

of hydro generation and nuclear growth.

A gain in industrial and retail sales, which increased a hair from 83 million tons in 1988 to 84 million tons a year later, was offset by a marginal loss in coking coal sales, from 42 million tons in 1988 to 41 million tons in 1989. The industrial-retail sector is expected to hold even in 1990, while coking coal could drop 7.3% to 38 million tons. Natural gas captured an additional 4.5% share of the industrial market in 1989.

Exports, at 99 million tons in 1989, were up 4.2% over the 95 million tons exported in 1988. Exports to Canada, at 18 million tons last year, slipped slightly from 19 million tons in 1988. Exports to other countries gained 6.6% to 81 million tons in 1989. The 1988 to-

tal was 76 million tons. Of the 1989 export total, two-thirds were metallurgical coal and one-third was for steam generation.

Exports in 1990 are expected to drop 1% to 98 million tons because of smaller demand by the Canadian steel industry and by France, which increased imports of U.S. coal by 2 million tons last year because of nuclear plant problems. The fastest-growing markets are on the Pacific Rim.

Of the total 1989 U.S. production, 591 million tons (60.6%) were produced in the East and 384 million tons were produced in the West. States that increased production were Virginia, West Virginia, Illinois, Alabama, Maryland, and Ohio. Production was lower in Kentucky, Tennessee, and Pennsylvania.

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ASSOCIATION CALENDAR

APRIL

National Air Filtration Association Annual Technical Seminar, April 6-7, Pacifica Hotel & Conference Center, Los Angeles, Calif.

Gas Appliance Manufacturers Association's Annual Meeting, April 8-11, Ritz Carlton Laguna Niguel, Laguna Niguel, Calif.

International Association of Refrigerated Warehouses' Annual Convention, April 22-26, Hyatt Regency Grand Cypress, Orlando, Fla.

American Welding Society's Annual Meeting, April 22-27, Anaheim Convention Center, Anaheim, Calif.

Air Movement and Control Association's Mid-Year Meeting, April 23-25, Hyatt Regency O'Hare, Rosemont, Ill.

National Association of Corrosion Engineers' Annual Convention, April 23-27, Bally's Casino Resort Hotel, Las Vegas, Nev.

Institute of Environmental Sciences' 36th Annual Technical Meeting and Equipment Exposition, April 23-27, Hyatt Regency, New Orleans, La.

Association of Home Appliance Manufacturers' Annual Meeting, April 29-May 1, The Registry Resort, Naples, Fla.

Absorption service training offered by Trane

SAN DIEGO — San Diego Trane Service will offer an absorption seminar April 17-18 at the Doubletree Hotel here. The seminar is designed for mechanical maintenance personnel.

Capacity control systems, troubleshooting, absorber components, purge systems, and electrical safety controls are some of the subjects that will be covered during the program.

Upon completion, the maintenance supervisor will be able to specify an effective preventive maintenance program for absorption chillers, diagnose minor operating problems, and identify major concerns requiring qualified assistance.

For more information, contact San Diego Trane Service at 619-576-2555, ext. 220.

Ferris State hosts refrigeration seminar

BIG RAPIDS, Mich. — A seminar covering today's technology in refrigerants and refrigeration systems is slated for April 19 at Ferris State University.

The seminar, featuring seven guest instructors, is aimed at industry professionals involved with the design, installation, and maintenance of refrigeration systems

that have traditionally used R-12 and R-502.

The program addresses low- and medium-temperature systems, refrigerants, and compressors for the 1990s.

Cost of the seminar is \$65. For more information, call 616-592-2340, or in Michigan, 800-562-9130.



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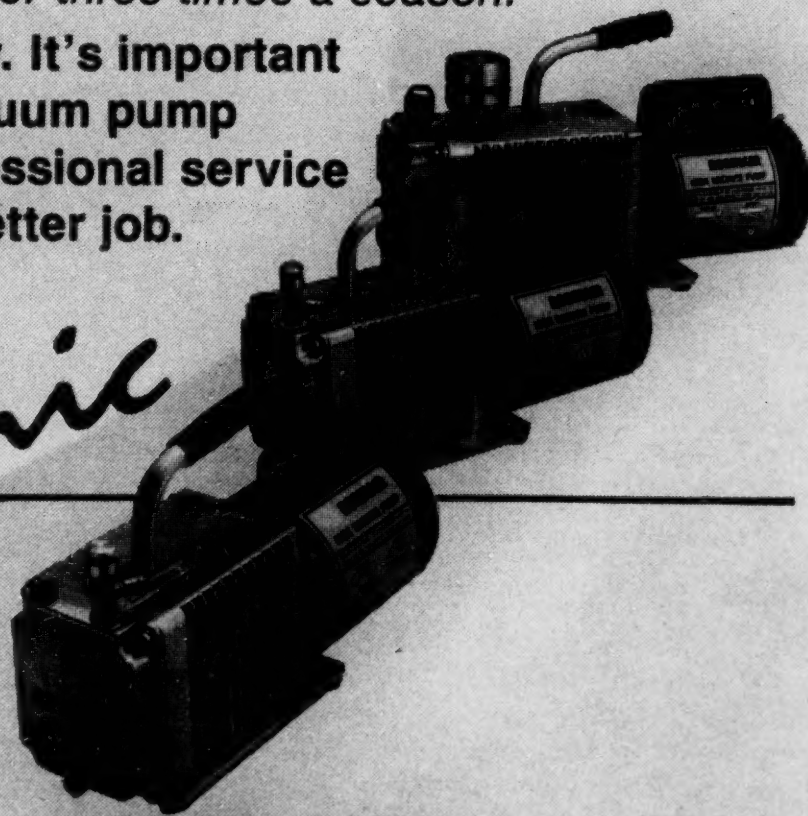
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